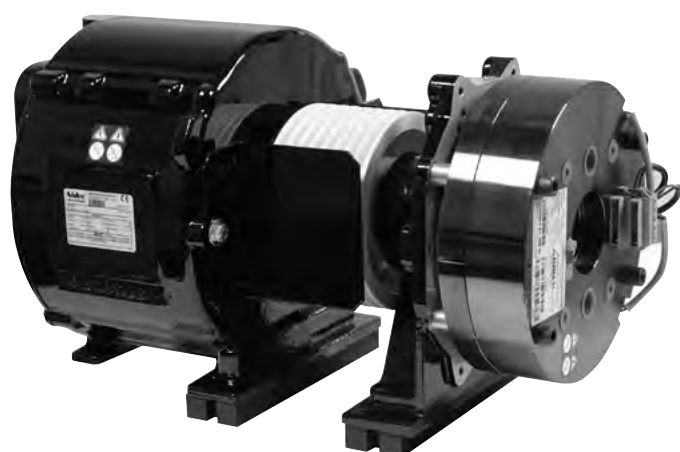


Nidec

All for dreams



Installation & maintenance

E27 Gearless

*Permanent magnet
synchronous motor for lifts*

Part number: 5323 en - 2018.04 / c

LEROY-SOMERTM

Dear Customer,

You have just acquired a Leroy-Somer Gearless motor.

*This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technology in automation, specially selected materials and rigorous quality control. As a result, the regulatory authorities have awarded our motor factories the **ISO 9001, Edition 2008 international certificate**.*

We thank you for making this choice, and would ask you to read the contents of this manual.

By observing a few essential rules, you will ensure problem-free operation for many years.

Moteurs Leroy-Somer

NOTE:

Leroy-Somer reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

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EC DECLARATION OF CONFORMITY AND INCORPORATION	4
IMPORTANT WARNING	5
1 - GENERAL INFORMATION	6
2 - RECEIPT & IDENTIFICATION	6
3 - ENVIRONMENT	6
4 - STORAGE	6
4.1 - Storage conditions	6
4.2 - Prolonged storage (> 3 months).....	7
5 - INSTALLATION	7
5.1 - Before installation	7
5.2 - General recommendation	7
5.3 - Mechanical installation.....	7
5.3.1 - Lifting the motor.....	7
5.3.2 - Installing the motor	8
5.3.3 - Traction ropes	8
5.3.4 - Ropes guard	9
5.3.5 - Optional	9
5.4 - Electrical connection using the cables supplied by Leroy-Somer	9
5.4.1 - Wiring the motor, the thermal sensor and the encoder	9
5.4.2 - Wiring the brakes.....	10
5.4.3 - Earth connection	10
5.5 - Details of the wire for the connection of the cables to the electrical cabinet.....	11
5.6 - Electrical connection using your own cables	12
5.6.1 - Reference of the connectors and contacts.....	12
5.6.2 - Recommendation	13
5.7 - Switching status of the microswitches	13
6 - SHORT-CIRCUITING OF THE PHASES	13
7 - COMMISSIONING.....	13
8 - MAINTENANCE	13
8.1 - Bearings	13
8.2 - After one month's operation	13
8.3 - After an emergency stop	13
8.4 - Every year.....	13
9 - APPENDIX 1.....	13
9.1 - Failsafe brakes : ALZOLA, INTORQ and MAYR	15

	POC6 : PRODUCT MANUFACTURING				Classement/File: C6M002-SO		
	DECLARATION OF CONFORMITY AND INCORPORATION FOR E27 MOTORS – Starting from 2017, September 1st –						Révision: B Date: 08/01/2018 Page : 1 / 1
QUALITY MANAGEMENT	Établi par / Author		Visa Q / Q Signature	Approuvé par / Approved by	M <input checked="" type="checkbox"/>	R <input type="checkbox"/>	I <input type="checkbox"/>
	S. LAMY		C. MOUNIER	L. BEGOT			
							Annule et remplace/ Cancels and replaces: C6M002-SO Révision A du/ from 16/02/2017
							Doc type: S6T002 Rev D du/ from 16/03/2017

Moteurs LEROY SOMER declares that the synchronous permanent magnet motors: E27S, E27M, E27L

- conform to the harmonized standard **NF EN 60034-1** and thus meet the essential requirements of the **Low Voltage Directive 2014/35/EC**;

- conform to the standards **NF EN 81-20 & NF EN 81-50**, and thus meet the essential requirements of the **Elevators Directive 2014/33/EC**;

- meet the essential requirements of the **Electromagnetic Compatibility Directive 2014/30/CE**, if they are used within certain voltage limits (**NF EN 60038**).

By reason of such conformity, these product ranges may be used in machines covered by the **Machinery Directive 2006/42/EC**, provided that the method of integration or incorporation and / or assembly conforms to at least the regulations in standard **NF EN 60204** « Electrical Equipment for Machinery » and our installation manual.

The products defined above must not be installed unless the machine in which they are incorporated has been declared as conforming to the relevant directives.




N.B: When products are powered by specially adapted electronic converters and / or servo-controlled by electronic control-command devices, they must be installed by a qualified professional person. This person must take responsibility for complying with the regulations concerning electromagnetic compatibility in the country where the machines are used.

Installation of these motors must comply with the regulations, decrees, laws, orders, directives, application circulars, standards, rules or any other document relating to the installation site. *Moteurs LEROY SOMER* accepts no liability in the event of failure to comply with these rules and regulations.

Drawn up at St-Symphorien d'Ozon on: 10/01/2018

The plant Quality Manager :



These symbols    appear in this document whenever it is important to take special precautions during installation, operation, maintenance or servicing of the motors.


It is essential that electric motors are installed by experienced, qualified and authorized personnel.


In accordance with the main requirements of EEC Directives, the safety of people, animals and property should be ensured when fitting the motors into machines.

Particular attention must be given to equipotential ground or earthing connections.

The following preliminary precautions must be taken before working on any stationary device:

- **Mains voltage disconnected and no residual voltage present**
- **Careful examination of the causes of the stoppage**
(jammed transmission - loss of phase - cut-out due to thermal protection, etc)

 **Even when not supplied with power, there is voltage at the terminals of a rotating synchronous motor with magnets.**
Accordingly, before carrying out any work check carefully that the motor is not rotating.

 **The short-circuiting of the phases is not allowed to manage the rescue operation of the lift.**

  **For dismantling the E27 motor only**

Assembly or maintenance of the rotor must not be carried out by people with pacemakers or any other implanted medical electronic device.

The motor rotor contains a powerful magnetic field. When the rotor is separated from the motor, its field may affect pacemakers or disturb digital devices such as watches, mobile phones, etc.

1 - GENERAL INFORMATION

1.1 - Warning

To ensure that the Leroy-Somer Gearless E27 you have just purchased is entirely satisfactory, it is essential to adhere to the following instructions.



WARNING

Contact with energized or rotating parts may cause injury.



WARNING

Do not touch the housing of a motor during operation, as it can reach high temperatures.

Reminder: installation, servicing and maintenance must only be carried out by qualified personnel. Failure to follow the instructions in this document or to apply them correctly, releases the manufacturer from responsibility. The product is covered by the warranty as long as any partial or total dismantling has only been performed with the assistance of Leroy-Somer (or its approval).



WARNING

Check that the lift car has been immobilized before performing any work on the motor or the brakes.

1.2 - Application

E27 motor is designed as a gearless drive for elevators. No other drive application is permitted without a written agreement from Nidec / Leroy-Somer.

E27 motor is a permanent magnet synchronous motor. Due to its very compact design, E27 is ideal for applications in machine roomless elevators

2 - RECEIPT & IDENTIFICATION

Inspect the machine as soon as it is received. If there is any damage that has been caused during transportation, contact immediately the carrier.

As soon as you receive the machine, check that the nameplate on the machine conforms to your order, see details below.

3 - ENVIRONMENT

The rated characteristics are given for operation in a standard environment (see IEC 600034-5):

- altitude less than 1000 m
- maximum relative humidity < 60%
- temperature between 0 and 40°C

Derating data can be provided if special conditions are indicated at the time when the equipment is ordered.

4 - STORAGE

4.1 - Storage conditions

The gearless should be stored in a horizontal position. The location must be dry and protected from harsh weather conditions, cold (temperature above -15°C), frequent temperature variations (to prevent the risk of condensation) and free from vibration, dust and corrosive gases. If there is any vibration in the storage area, it is advisable to rotate the driving sheave at least twice a month (supply power to the brakes in order to be able to turn the sheave). For certain transport conditions the grooves of the driving sheave are protected by a special varnish. This varnish must not be removed during storage.

Maximum load authorized on the sheave

Nidec LEROY-SOMER
 GEARLESS LEROY-SOMER
 N°402075/003/2014/11
 MADE IN FRANCE
 Code: S278077

Motor serial number

Gearless type → Type E27M
 Max Sheave Load 1500 Kg
 Weight 106Kg → Motor weight

MOTOR			
Voltage	360V	Rated motor current	9,1A
Frequency	47,8Hz	Duty	S5-40%
Speed	239rpm	Rated Power	4,4kW → Rated motor power
Insul. Class	F	Starts/h	180
Amb. Temp	40°C	Enclosure	IP 23

Rated motor voltage

Rated motor speed

BRAKE	
Torque	2X225Nm → Rated braking torque
Voltage	103/205V → Rated braking voltage
Current	2X1,07A → Rated brake current

Motor nameplate

4.2 - Prolonged storage (> 3 months)

- Place the machine in a sealed waterproof enclosure with a dehydrating bag inside corresponding to the volume to be protected and the degree of humidity of the location.
- The bearings which can not be regreased must be replaced after a storage longer than 3 years.

5 - INSTALLATION

5.1 - Before installation

If the equipment has been stored for several months, it is essential to check the correct insulation between the phases and the earth terminal on the motor (minimum 100 MΩ at 500 V D.C. for 60 seconds) after having disconnected all the electronic circuits if necessary.

⚠ Do not apply the megohmmeter to the terminals of the thermal sensors as this may damage them.
If the required value is not reached, dry the motor using internal or external heating.

Drying using external heating

- Place the motor in an oven at 70°C for at least 24 hours until the correct insulation is obtained (100 MΩ).
- Take care to increase the temperature gradually to clear the condensation.
- After drying at ambient temperature during the cooling phase, check the insulation value regularly, as it will initially tend to fall, then rise.

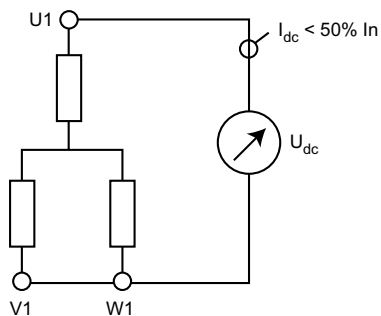
Drying using internal heating (drawing 1)

- Connect motor windings V1 and W1 in parallel in relation to U1.
- Read off the resistance between U and V//W.
- Apply a low voltage D.C. current to them (to obtain 10% of the rated current calculated using the winding resistances), then increase the voltage until 50% of the rated current is reached
- Maintain the power for 4 hours. The temperature of the motor should increase slightly.

⚠ If the brakes are released, the sheave will move slightly on power-up (angular setting of the rotor in relation to the stator).

Drawing 1

Winding connections for drying using internal reheating



5.2 - General recommendation

The installation must comply with the motor characteristics indicated on the nameplate (see section 1). It must include electrical safety devices. Check that the handling equipment (slings, etc.) is suitable for the weight of the machine. Use the attachment points provided on the machine. Check that the cables are correctly positioned so that they are not damaged. Provide the necessary mechanical protection devices to prevent people working on the machine becoming caught or trapped by the sheave and/or the cables. During building works, we recommend to protect the brakes and micro-switches against dust (by wrapping them into a shrink film for example). If the site is permanently subject to dust, we recommend to fit the brakes cover available as an option. The motors must be installed in such a way that the cooling air (not too damp, dust-free, and containing no corrosive gases or vapors) circulates freely. For the ease of access to the encoder, we recommend to install the motor with a minimum distance of 200mm between the cast iron cover protecting the encoder and the wall of the elevator shaft.

5.3 - Mechanical installation

5.3.1 - Lifting the motor



Pic. 3 : Lifting the motor (for illustration only)

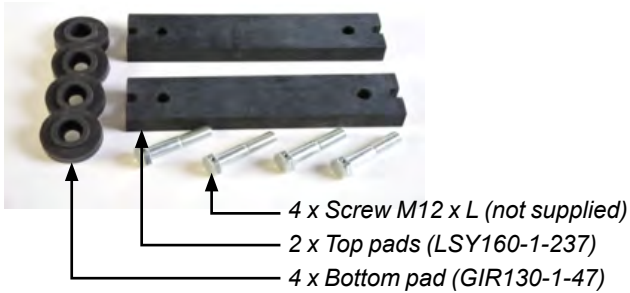
Weight of the motor (kg)		
E27S	E27M	E27L
93 kg	106 kg	167 kg

5.3.2 - Installing the motor

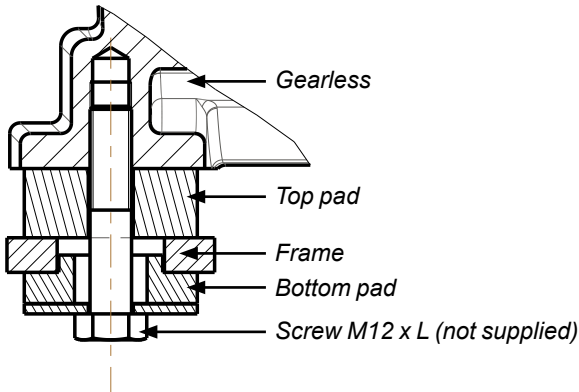
The Gearless motor must be installed on a chassis that is not subject to vibration and must be secured using 4 M12 screws class 8.8.

The permissible unevenness of the chassis is 1 mm.

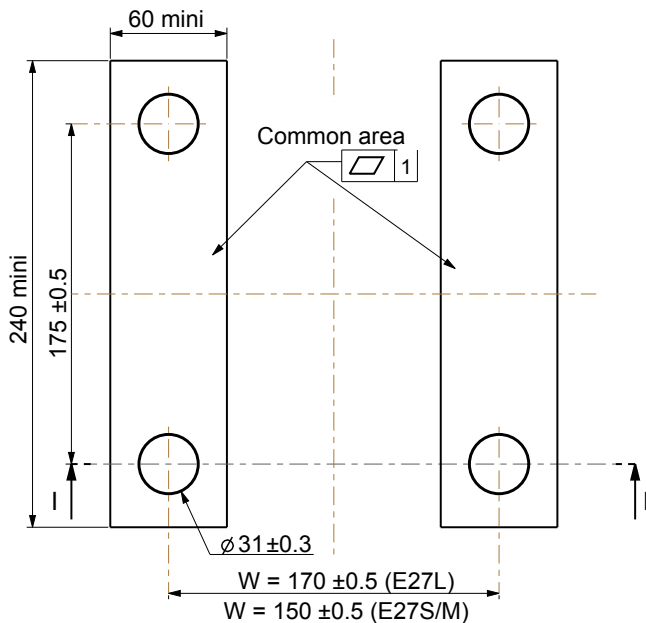
Due to the mechanical construction of the motor, this is mandatory to use the isolation pads supplied for the fixing of the motor onto the chassis (2 rectangular pads to be installed under the motor feet and 4 round pads to be installed under the chassis).



The mounting principle is as follows:



The chassis must be drilled as follows:



Motor type	W (mm)
E27S	150 +/- 0,5
E27M	150 +/- 0,5
E27L	170 +/- 0,5

The fixing screws (not supplied) must be tightened once the traction ropes and the traction sheave are perfectly aligned and once the full load is applied onto the traction sheave. After contact of the screw's head with the metallic washer, tighten of 1 turn with a tolerance of 0/+¼ of turn.

For securing the fixing screws, use a thread locking glue (low or mid strength) applied onto the 10mm of the screw end or a mechanical seal on the screws heads (linking two screws).

Below are the recommended screw's lengths depending on the thickness of the chassis:

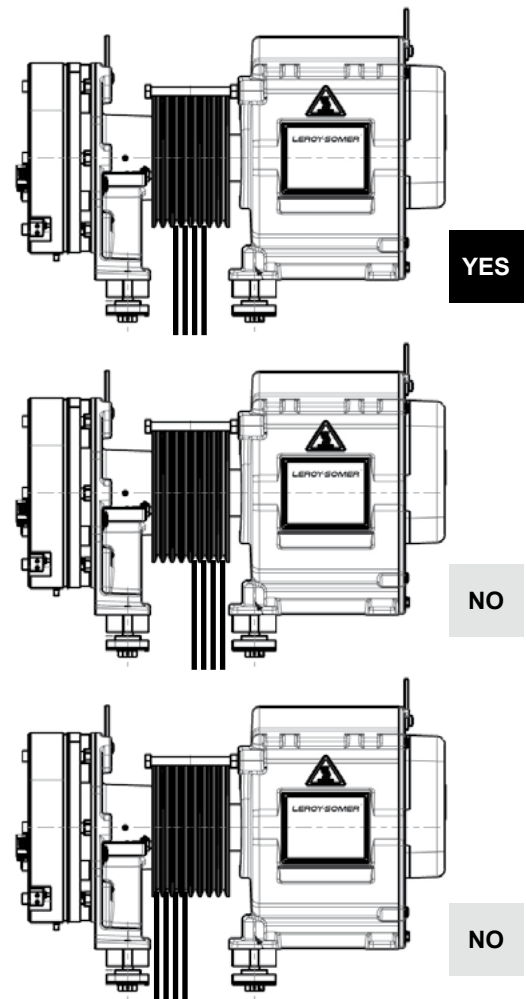
Thickness of the chassis	6 to 8 mm	10 to 12 mm	< or = 16
Screw length	50 or 55 mm	55 or 60 mm	60 or 65 mm

5.3.3 - Traction ropes

Check that the traction ropes are of correct type for the sheave of the motor.

The rope pull must be vertical.

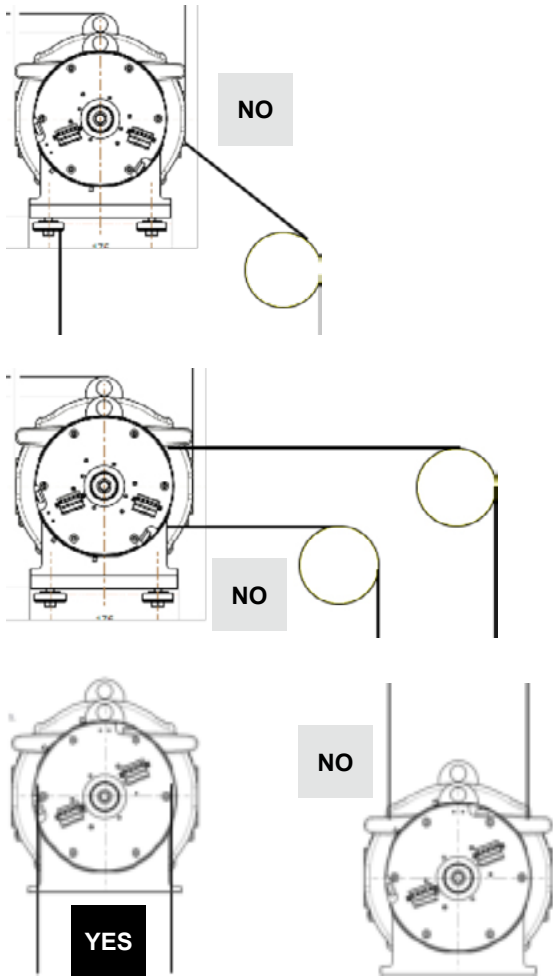
If the number of grooves available on the traction sheave is higher than the number of ropes installed then the ropes must be centered on the sheave.



Positioning of the traction ropes

The motor's fixing screws must not be loaded with a shearing force.

The direction of the force applied onto the traction sheave must be vertical and must be perpendicular to the motor feet. the force applied must compress the isolation pads.



5.3.4 - Ropes guard



When the ropes have been installed, fit the ropes guard system.

Ropes guard system: 2 blades
2 screws HM8 x 16
2 washers 8-22/2

Installation:

- Use one of the 3 appropriate holes on the blade, depending on ropes wrapping angle on the sheave (centered one in the most of case).
- Screw one blade on each side of the sheave, using the 2 threaded holes on motor housing.
- Use Loctite 242 (or equivalent) on the tap of each bolt
- Adjust the distance between blade and sheave:
distance < 0.8 rope diameter.
- Tighten at a torque of 15 N.m +/- 10%.

⚠ There is a high risk of jamming your fingers between the cables and the sheave.

5.3.5 - Optional

Protection device for sheave and/or brake.

E27 motor is available with 2 additional options:

- Protection device for sheave
- Protection device for brake



Sheave protection



Brake protection

Installation:

When the ropes have been installed, fit the protection device for sheave or for brake.

Sheave or brake protection device: 1 cover blade
2 screws HM8 x 16
2 washers 8-22/2

- Screw the cover blade, using the 2 threaded holes on brake support.
- Use Loctite 242 (or equivalent) on the tap of each bolt
- Tighten at a torque of 15 N.m +/- 10%.

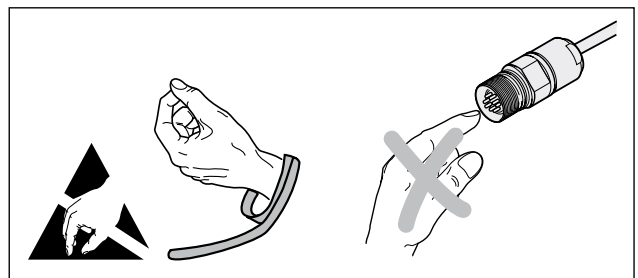
⚠ There is a high risk of jamming your fingers between the cables and the sheave.

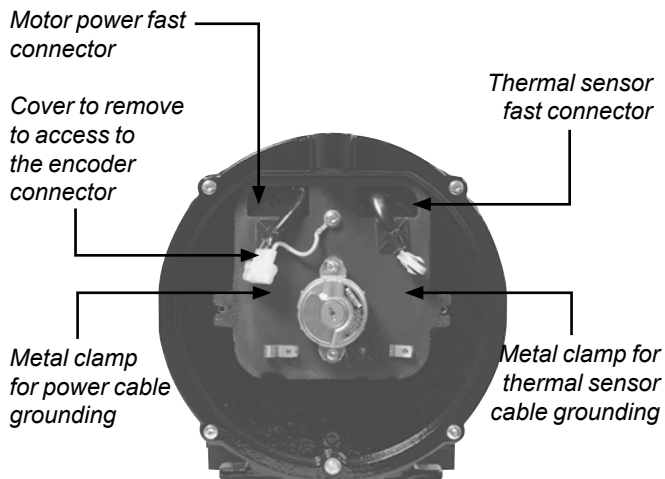
5.4 - Electrical connection using the cables supplied by Leroy-Somer

5.4.1 - Wiring the motor, the thermal sensor and the encoder

Remove the cover using a Torx screwdriver or key, reference TX 30.

When working on the encoder please follow the below recommendation:



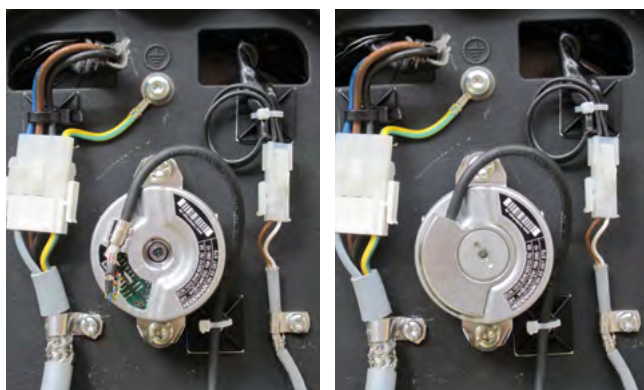
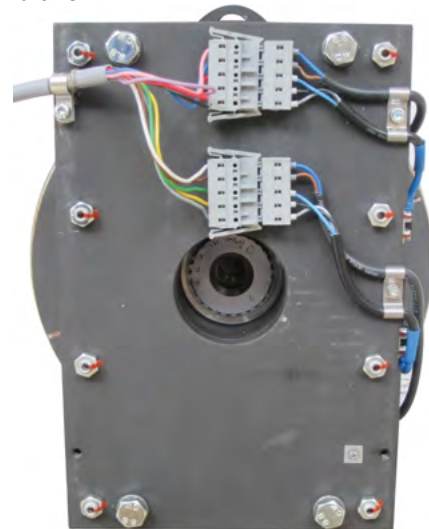


Details of the connections

INTORQ brake



MAYR brake



The grounding of the cable shielding is done using the metal clamps

The encoder protection cover is refitted

The grounding of the cable shielding is done using the metal clamps.

Once the connections are done, refit:

- the encoder protection cover using a flat screwdriver,
- the main cover making sure that the electrical cables are correctly positioned in the cover openings. Tightening torque : 8N.m.

5.4.2 - Wiring the brakes

For wiring the brakes, please refer to the nameplate applied onto the brakes and to the appendix 1 of this manual.

ALZOLA brake

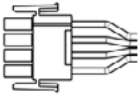
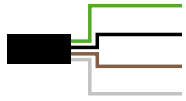


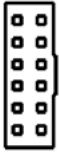
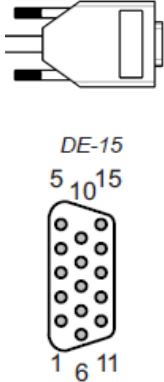





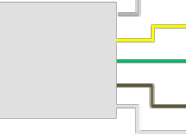
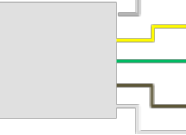
5.4.3 - Earth connection


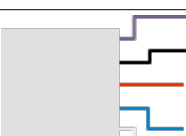








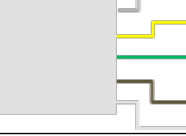
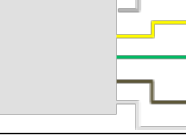
Connect the earth using the dedicated terminals on both motor and brakes.

5.5 - Details of the wire for the connection of the cables to the electrical cabinet

FOR ALL E27 TYPE					
Motor side	Connector	Type of cable		Electrical cabinet side	
Green/Yellow		Power cable		Green/Yellow	Ground
Black				U1	
Brown				V1	
Blue or grey				W1	
Black		Thermal sensor cable		Brown	PTC
Black				White	
		Encoder cable		1	Cos
				2	CosRef
				3	Sin
				4	SinRef
				5	Data
				6	Data\
				7	-
				8	-
				9	-
				10	-
				11	Clock out
				12	Clock out\
				13	+5V
				14	0V
				15	-

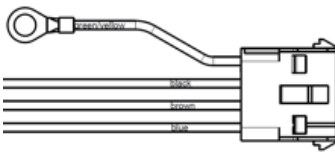
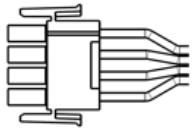
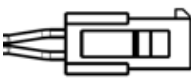
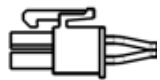
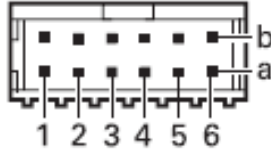
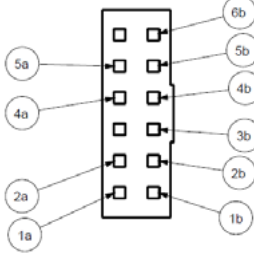



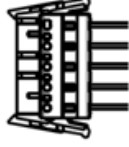

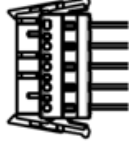

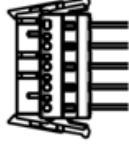
FOR E27S, M and L (ALZOLA brakes)								
Wires from brake/motor	Connector	Type of cable		Wires for electrical cabinet connexions				
Red		Brakes cable		Purple	Microswitch	NO	NC	
Black				Black				
Dark blue				Red				
Brown				Blue	Brake coil			
Blue				Pink	Brake coil			
Red					Grey	Microswitch	NO	NC
Black					Yellow			
Dark blue					Green			
Brown					Brown	Brake coil		
Blue					White	Brake coil		

FOR E27S AND E27M (Intorq brakes)								
Wires from brake/motor	Connector	Type of cable		Wires for electrical cabinet connexions				
Grey		Brakes cable		Purple	Microswitch	NO	NC	
Black				Black				
Dark Blue				Red				
Blue				Blue	Brake coil			
Black				Pink	Brake coil			
Grey					Grey	Microswitch	NO	NC
Black					Yellow			
Dark Blue					Green			
Blue					Brown	Brake coil		
Black					White	Brake coil		

FOR E27L (Mayr brakes)								
Wires from brake/motor	Connector	Type of cable		Wires for electrical cabinet connexions				
Grey		Brakes cable		Purple	Microswitch	NO	NC	
Black				Black				
Blue				Red				
Brown				Blue	Brake coil			
Dark Blue				Pink	Brake coil			
Grey					Grey	Microswitch	NO	NC
Black					Yellow			
Blue					Green			
Brown					Brown	Brake coil		
Dark Blue					White	Brake coil		

5.6 - Electrical connection using your own cables

5.6.1 - Reference of the connectors and contacts

Motor side			Customer side			
			Connector	Reference		
Green/Yellow	Ground			Connector: TECO ELECTRIC 1-480702-0 or equivalent Contacts : MNL 926884-1		
Black	U1					
Brown	V1					
Blue	W1					
Black	PTC			Connector: MOLEX ref.: 39-01-3028 Contacts : MOLEX série 5556 or TECO ELECTRIC ref. : 0-350777-1		
Black						
	2a	Cos			2a	Cos
	5b	CosRef			5b	CosRef
	4a	Sin			4a	Sin
	3b	SinRef			3b	SinRef
	6b	Data			6b	Data
	1a	Data\			1a	Data\
	-	-			-	-
	-	-			-	-
	-	-			-	-
	-	-			-	-
	2b	Clock out			2b	Clock out
	5a	Clock out \			5a	Clock out \
	1b	+5V			1b	+5V
	4b	0V			4b	0V
	-	-	-	-		
See colors depending on brake manufacturer, in 4.5	Brakes coil				Wago ref. 231-205 / 037-000	
	Brakes coil					
	Microswitch	NO	NC			
		NO	NC			
	Brakes coil					
	Brakes coil					
Microswitch	NO	NC				
	NO	NC				

5.6.2 - Recommendation

Connect the motor using cables of the correct cross-section

Nominal current per phase (A)	9.5	12	16
Min. cable cross-section (mm²)	1.5	1.5	2.5

The cable shielding must be connected to earth, see section 4.4.

It is the responsibility of the user to connect the motor in accordance with the current legislation and regulations in the country of use. This is particularly important as regards the size of the cables, the type and size of fuses, the earth or ground connection, powering down, acknowledging insulation faults and protection against overcurrents.

The table above is given for information only and must under no circumstances be used in place of the current standards.

The recommended cross-sections are given for a single-wire cable, with a maximum length of 10m. Above this, line drops due to the cable length must be taken into account.

5.7 - Switching status of the microswitches

Contact	Colors of the wires		Brake released	Microswitch closed
	Connector fitted onto the brakes	Cables supplied by Leroy-Somer		
NC contact	Black / Grey	Yellow/Grey	YES	NO
		Black/Purple	NO	YES
NO contact	Black/ Dark Blue	Yellow/Green	YES	YES
		Black/Red	NO	NO

6 - SHORT-CIRCUITING OF THE PHASES

The short-circuiting of the phases is not allowed to manage the rescue operation of the lift

7 - COMMISSIONING

Check that the electrical equipment is correctly earthed before starting work.

Before commissioning the machine, check that all the fixings and electrical connections are correctly tightened.

During commissioning, check for noise and vibration and monitor the current and voltage on the machine while it is operating at rated load.

8 - MAINTENANCE

8.1 - Bearings

The bearings do not require any maintenance as they are greased for life.

8.2 - After one month's operation

- Check that the screws and electrical connections are correctly tightened.

- Check that there is no abnormal noise. Check the vibration. We recommend to stop the lift in case of tangible vibration and to control the complete installation.

- Check the brakes airgap. Please refer to the appendix 1 of this manual.

8.3 - After an emergency stop

Check the brakes airgap. Please refer to the appendix 1 of this manual.

8.4 - Every year

Same as section 8.2.

9 - APPENDIX 1

9.1 - Failsafe brakes

See following pages

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INSTALLATION MANUAL FOR EVO BRAKES



DATE OF CREATION: 18/03/2013
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ÍNDICE

1	SAFETY INSTRUCTIONS:	3
1.1	Symbols used:.....	3
1.2	General instructions:	3
2.	PRODUCT DISCRIPTION:	3
2.1.	Operating principle:	3
2.2.	Labelling:.....	4
2.3.	Physical dimensions:.....	5
2.4.	General characteristics:	6
2.5.	Available tothing:.....	6
2.6.	Product reception:	7
2.7.	Warranty:.....	7
2.8.	Legal regulations:.....	7
3	MECHANICAL INSTALLATION:.....	8
3.1	Before starting:.....	8
3.2	Tools:.....	8
3.3	Installation:	8
3.4	Screw torques:	9
3.5	Shipping screws:	9
3.6	Positioning the rubber dust cover:	10
3.7	Positioning the manual release lever:	11
4	ELECTRIC INSTALLATION:.....	16
4.1	Before starting:.....	16
4.2	Tools:.....	16
4.3	Brake connection:	17
4.4	Detector connection (<i>micro-switches</i>):.....	17
5	OPERATIONAL CHECK:	18
6	MAINTENANCE:	18
6.1	<i>Air-gap</i> verification:.....	19
6.2	Detector verification:.....	19
6.3	Winding verification:	20
7	SPARE PARTS:	20
7.1	Disc replacement:	20
7.2	Replacement and adjustment of detectors (<i>micro-switches</i>):.....	22
7.3	Replacement of the manual release lever:	28
8	POTENTIAL FAILURES:.....	29

1 SAFETY INSTRUCTIONS:

1.1 Symbols used:



Danger – Warning.



Electrical hazard.



Information.

1.2 General instructions:



Every intervention must be carried out by authorised personnel who are in possession of this manual.

- Brake installation.



Danger of entrapment.



Electrical hazard.

- Maintenance.

During maintenance work, ensure that the braking mechanism is in standby mode and there is no risk of accidental starting up.



Danger of entrapment.



Electrical hazard.



Danger of lift falling.

2. PRODUCT DISCRIPTION:

2.1. Operating principle:

The EVO brake family belongs to the compression spring type of brakes. In the absence of an electric current, springs, located in their casing, exercise a force on the mobile plates that stops the movement of the friction disc. When the electromagnet is connected, the magnetic field generated attracts the mobile plates, displacing them and releasing the friction disc. The displacement of the mobile plates may be monitored by use of detectors (*micro-switches*).

The following image makes it possible to notice the main components that make up an EVO brake.

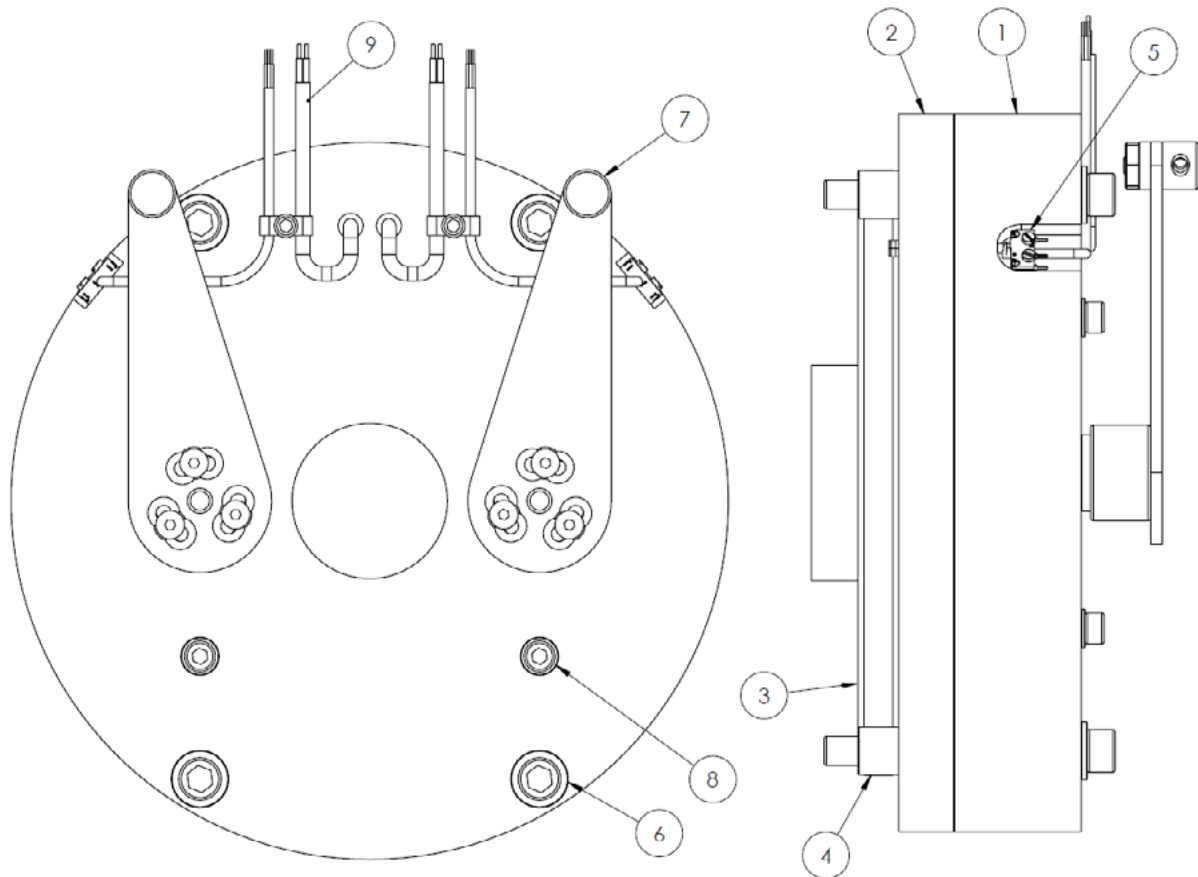


Fig. 1

Number	Description
1	Casing
2	Mobile plates
3	Disc
4	Hubs
5	Detectors (<i>micro-switches</i>)
6	Fixing screws
7	Manual release lever
8	Shipping screws
9	Cables

Table 1

2.2. Labelling:

All ALZOLA brakes belonging to the EVO family incorporate two labels. In the first are marked the main technical characteristics of the brake model. In the second the serial number, brake model within the EVO range, and a safety information note are specified.

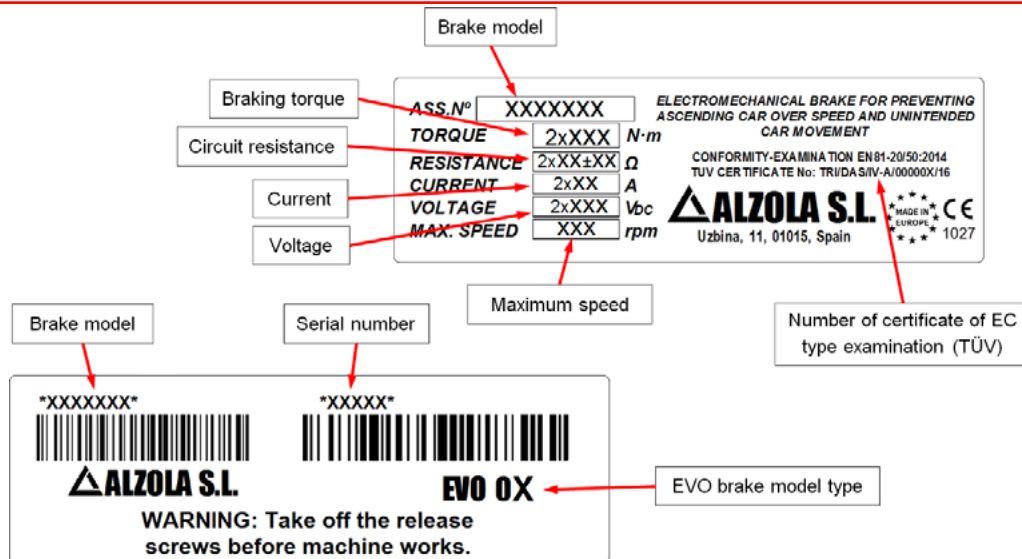


Fig. 2

2.3. Physical dimensions:

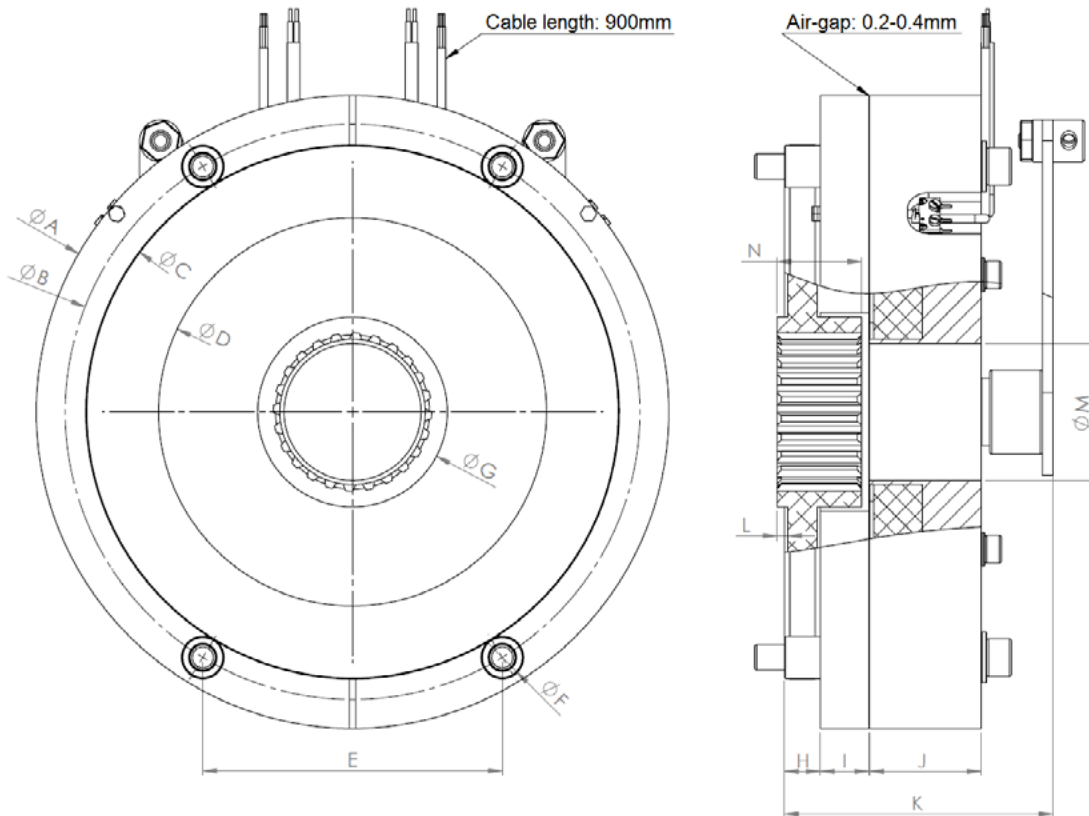


Fig. 3

Model	Dim. A	Dim. B	Dim. C	Dim. D	Dim. E	Dim. F	Dim. G	Dim. H	Dim. I	Dim. J	Dim. K	Dim. L	Dim. M	Dim. N
EVO-01	238	213	185	138	114	18	80	17	22	48	120	0	65	35
EVO-02	275	245	225	184	173,2	18	90	17	22	47	120	0	65	35
EVO-03	300	272,5	250	184	142	20	90	17	23	53	125	5	65	40
EVO-04	348	318	292	232	166	20	110	17	23	58	132	5	110	40
EVO-05	450	415	385	325	222	25	118	17	23	58	139	5	95	40

Table 2

2.4. General characteristics:

Model	EVO-01	EVO-01 SE	EVO-02	EVO-02 SE	EVO-03	EVO-03 SE	EVO-04	EVO-04 SE	EVO-05	EVO-05 SE
Static torque (-15%, +50%) [N·m]	2x200	2X250	2x450	2x550	2x800	2x900	2x1100	2x1300	2x2000	2x2300
Dynamic torque (-0%, +50%) [N·m]	2x200	2X250	2x450	2x550	2x800	2x900	2x1100	2x1300	2x2000	2x2300
Maximum speed [r.p.m]	620		764		637		350		350	
Nominal air gap [mm]	0.20/0.40		0.20/0.40		0.20/0.40		0.20/0.40		0.20/0.40	
Maximum admissible air gap [mm]	0.55									
Over-excitation	NO	Sí	NO	SI	NO	SI	NO	SI	NO	SI
Voltage [V _{dc}]	207	207/104	207	207/104	207	207/104	207	207/104	207	207/104
Resistance [Ω]	690	333	504	210	306	200	231	133	133	80
Connection	PARALELO									
Power [W]	2X62	2x (128/32)	2x85	2x (204/51)	2x140	2x (214/54)	2x185	2x (322/81)	2x322	2x (535/135)
ED	0.5									
Sound Level [dB]	< 55 dB (A) a 1 m									
Maximum ambience Temp [°C]	40									
Maximum voltage to operate detectors (<i>micro-switches</i>)	30 Vdc (Mechanical detector) / 24 Vdc (Optical detector)									
Maximum intensity for detectors (<i>micro-switches</i>) to operate	0,1 A (Mechanical detector) / 15 mA (Optical detector)									
Peso [Kg]	23		29		39		54		113	
Exam type CE 2014/33/EU (Annex IV A) EN 81-1:1998+A3:2009 EN 81-20:2014 EN 81-50:2014	TRI/DAS.IV-A.000001/16		TRI/DAS.IV-A.000002/16		TRI/DAS.IV-A.000003/16		TRI/DAS.IV-A.000004/16		TRI/DAS.IV-A.000005/16	
System to ensure quality according to 2014/33/UE (Annex VII)	77600150004									

Table 3

2.5. Available tothing:

The following table shows the standard tothing of the EVO range brake discs:

DIN	5480				
d _B [mm]	55	60	65	75	85
m	2	3	3	3	3
z	26	18	20	24	27
Pressure angle[°]	30				
Tolerance	7H				

Table 4

For measurements different from the above table, consult ALZOLA.



You must ensure that the tothing is sufficiently robust for the requirements of the application.

2.6. Product reception:

The type of packaging may vary according to the brake model and the shipping batch.

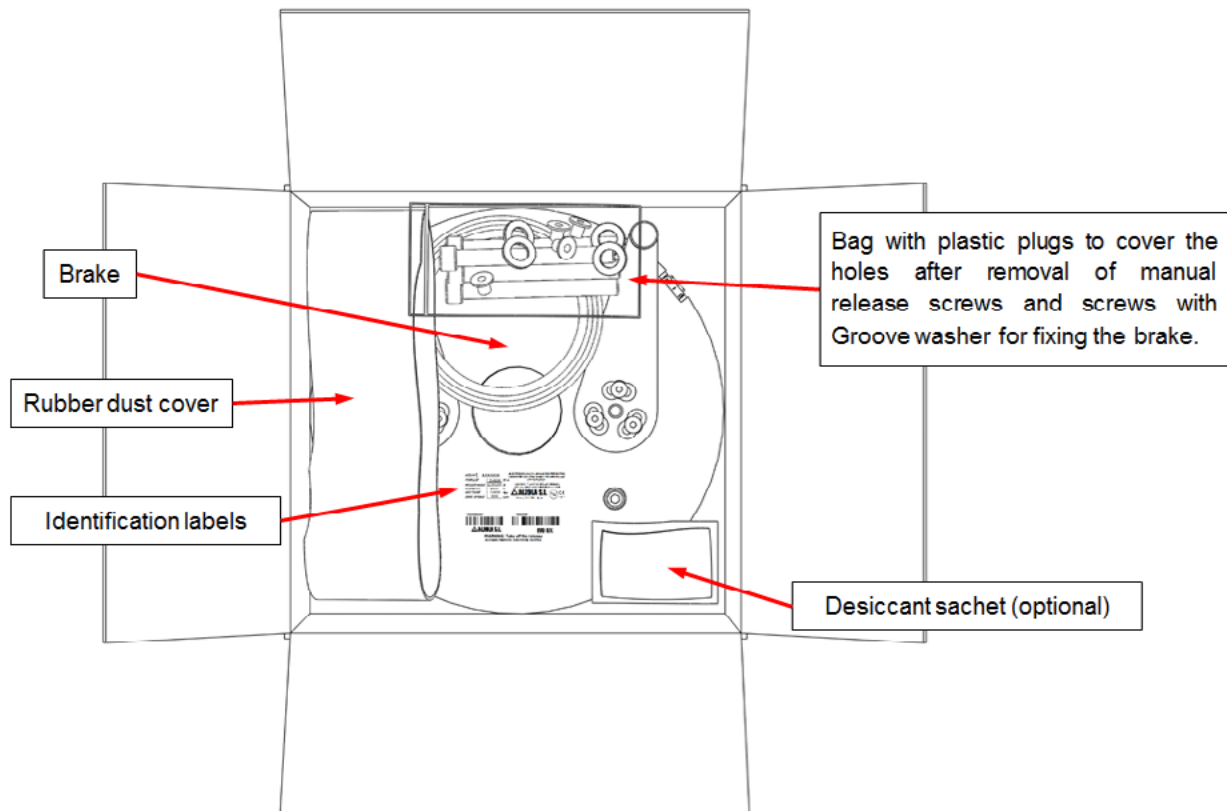


Fig. 4

2.7. Warranty:

Unless there is a specific agreement with the client, the terms of Warranty shall be the general ALZOLA terms, set in the quotation conditions.

Any modification or manipulation carried out on the brake without the express authorization of ALZOLA, as with any use not complying with the technical specifications set by ALZOLA, shall lead to the suppression of the Warranty and the annulment of ALZOLA's liability with regard to the non-conformity.

2.8. Legal regulations:

UNE-EN 81-20/50: 2014: Safety rules for the construction and installation of lifts. Part 1: electric lifts.


In order for the brake to conform to the directive 2014/33/UE, the integrator must respect the general implementation and use conditions defined in the CE type certificate exam established by the notified body.

3 MECHANICAL INSTALLATION:

3.1 Before starting:

Check that the brake is suitable for the machine. Check the characteristics plate check that both the operating voltage and the braking torque correspond to the requirements for the installation.

3.2 Tools:

	Degreasing agent
	Scissors
	Allen Keys
	Screwdriver
	Feeler gauge
	Torque wrench

3.3 Installation:

1º- Check the position is perpendicular between the axle and the support surface of the brake.



Danger: Do not hang the brake from the cables: this may lead to damage to the brake and/or the brake falling.

2º- Degrease the friction material support surfaces.



Danger: Deficient cleaning of the braking surfaces may lead to a decrease in the brake torque.

We recommend the use of *Loctite® 7063* or similar. Procedure: Apply the spray on the two support sides of the brake disc. Clean both sides with a clean cloth. Repeat the process until no dirt shows on the cloth.

3º- Place the disc in the machine axle groove. Remove the film protection from the disc. Move the disc to its end position in contact with the braking surface of the machine. The adjustment must slide and not be loose.



Danger if loose.



The disc brakes must not be contaminated.

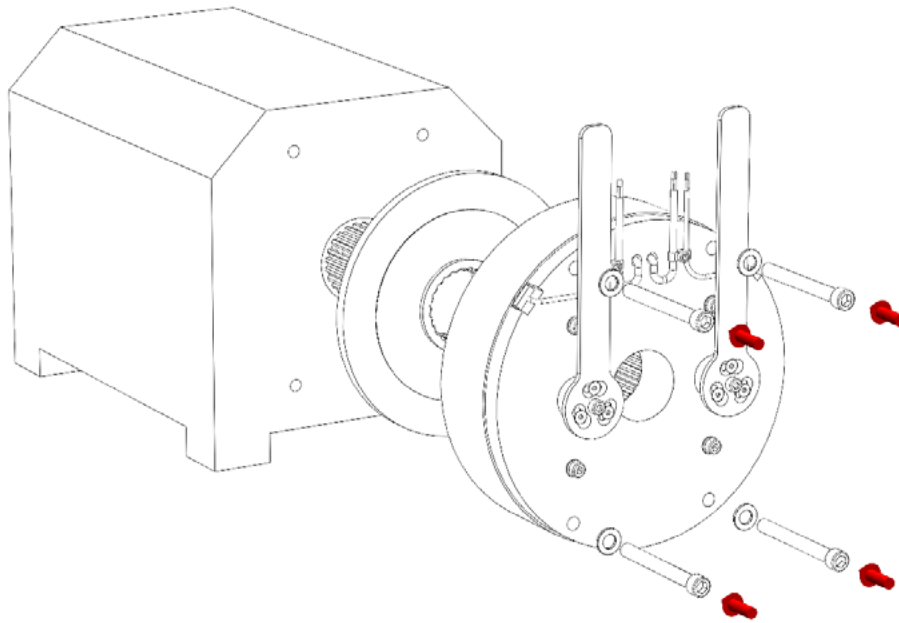


Fig. 5

4º- Position the brake in the machine and clamp it to it by tightening the corresponding fixing screws. You should guarantee the correct concentricity between the machine axle and the central gap of the brake (in which the *encoder* is usually clamped).

3.4 Screw tightening torques:

Screw tightening torques must be respected: insufficient tightening may lead to the separation hubs being displaced and the corresponding transmission of the braking torque to the fixing screws, with the risk of them shearing. An excessive tightening may also jeopardise the safety of the brake. The use of torque wrenches is recommended.

Screw type (Metric-Class)	Tightening Torque [N·m]	Location
M3 - 5.6	0,44	<i>Micro-switches</i>
M4 - 8.8	2,2	<i>Micro-switch controller</i>
M6 - 8.8	7,5	Manual release lever
M8 - 8.8	18,2	Manual release
M10 - 8.8	36	Brake fixing
M12 - 8.8	62	Brake fixing
M14 - 8.8	99	Brake fixing
M16 - 9.8	173	Manual release lever

Table 5

3.5 Shipping screws:



Danger of the lift falling.

These screws are painted red. Clamp the mobile plates to the casing through the holes found in the casing. They must be removed following the mechanical installation of the brake. Tightening them will cause the mechanical release of the brake. They must never be placed in the installation, to avoid them being accidentally tightened and causing the lift to fall.

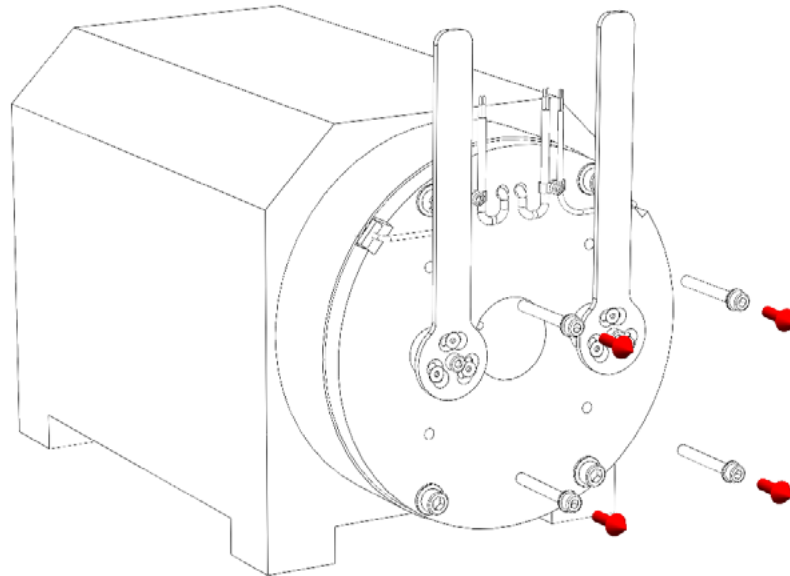


Fig. 6

After being removed, it is convenient to place the caps supplied with the brake to avoid the insertion of particles in the inside of the brake.



If the brake incorporates *Bowden* release levers (by cable), once the opening cables have been placed in position, the red fixing screws must be removed from the handles. If the screws remain tight they could cause the brake to be released and the lift to fall.

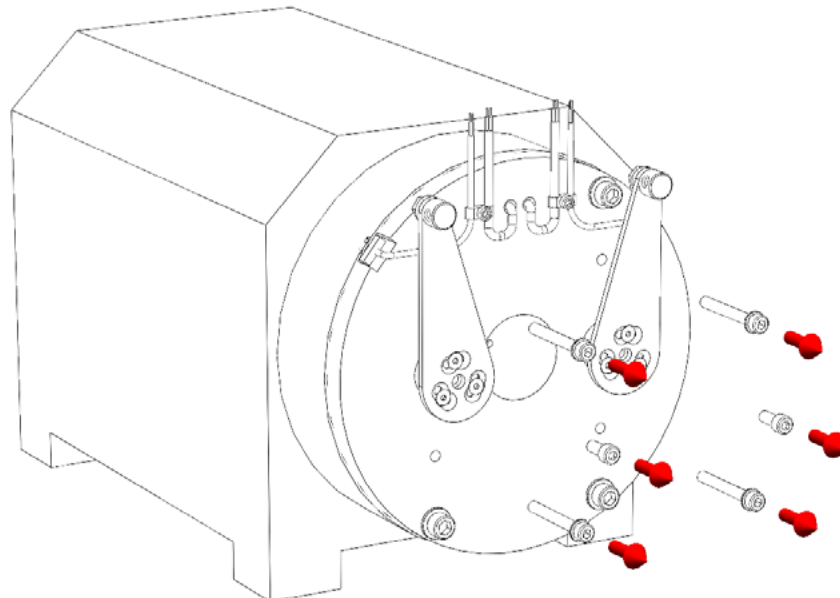


Fig. 7

3.6 Positioning the rubber dust cover:



Position the rubber dust cover before plugging in the electric connection.

Once the brake has been clamped to the machine place the rubber. The rubber avoids the insertion of dirt particles in the mobile parts the brake. Precaution: It is not prepared to prevent penetration by liquids.



Optical detectors must be covered, as they are sensitive to dirt and light.

3.7 Placement of the manual release lever:

Types of lever and their components:

- “Manual Release Lever”:

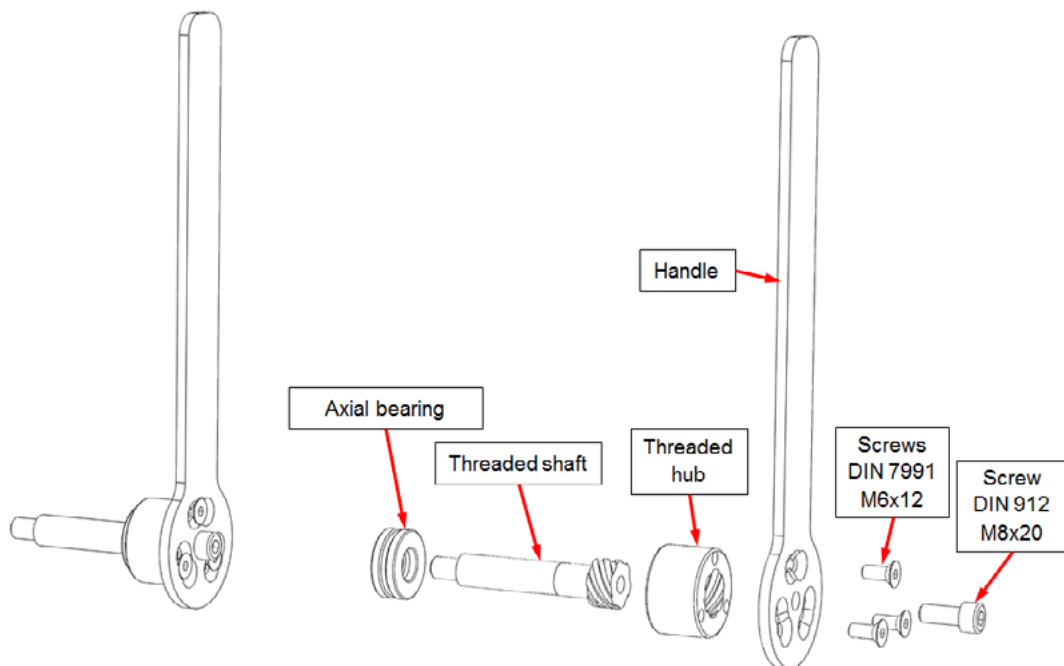


Fig. 8

- “Bowden Release” Lever (by cable):

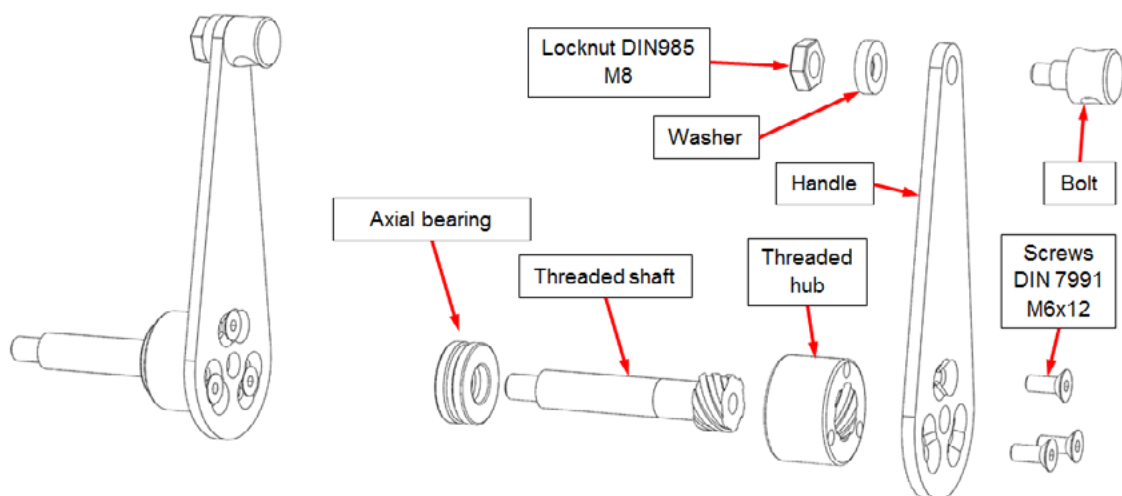


Fig. 9

Both lever models share the same brake assembly process.

Tools to be used:



Installation Process:

EVO brakes may be factory supplied with the lever, but if this is not the case, and installation was required by the client, the following procedure should be observed:

Following a mechanical and electric installation of the brake

- 1- Remove the central caps from the brake:

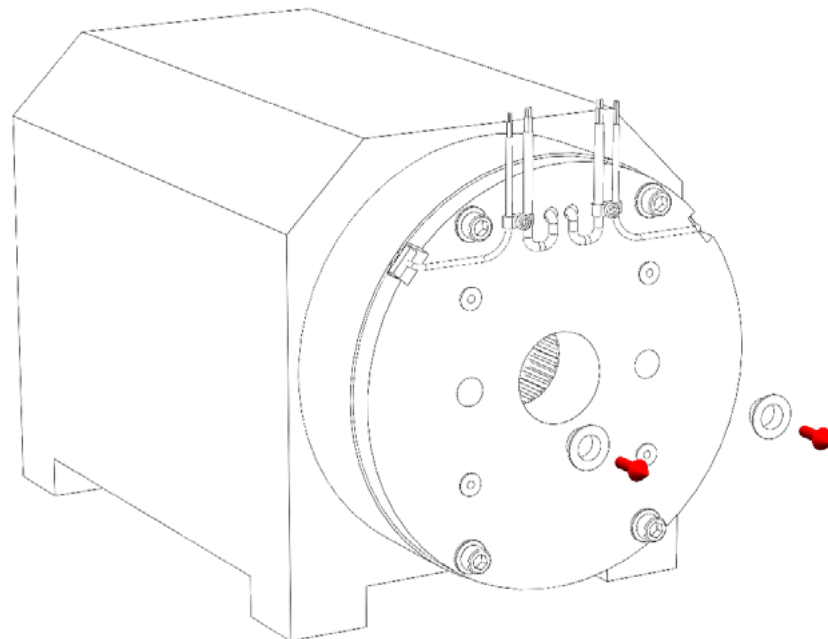


Fig. 10

- 2- Lubricate the threads of the lever axle and the screwed hub. Position the axial roller and clamp the handle to the screwed hub using the three screws.

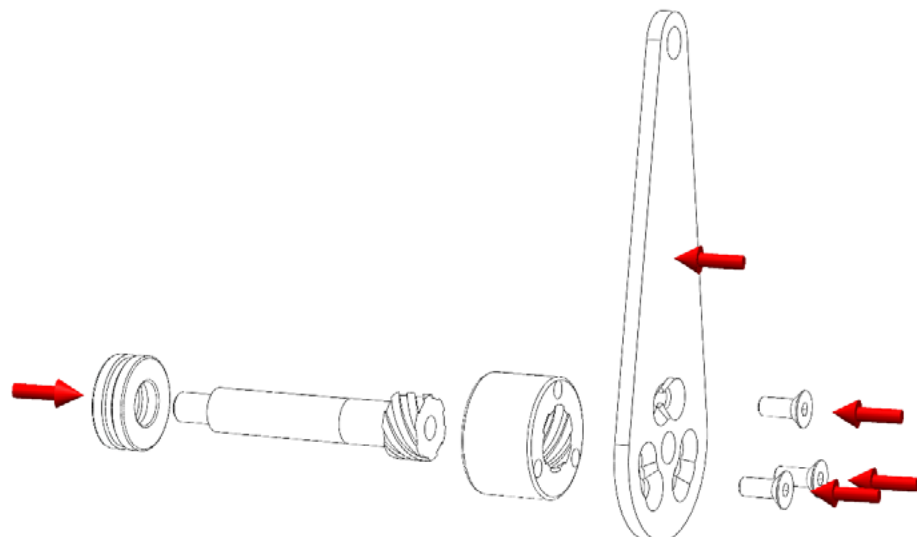


Fig. 11

- 3- Position the above set in one of the open holes after removing the caps.

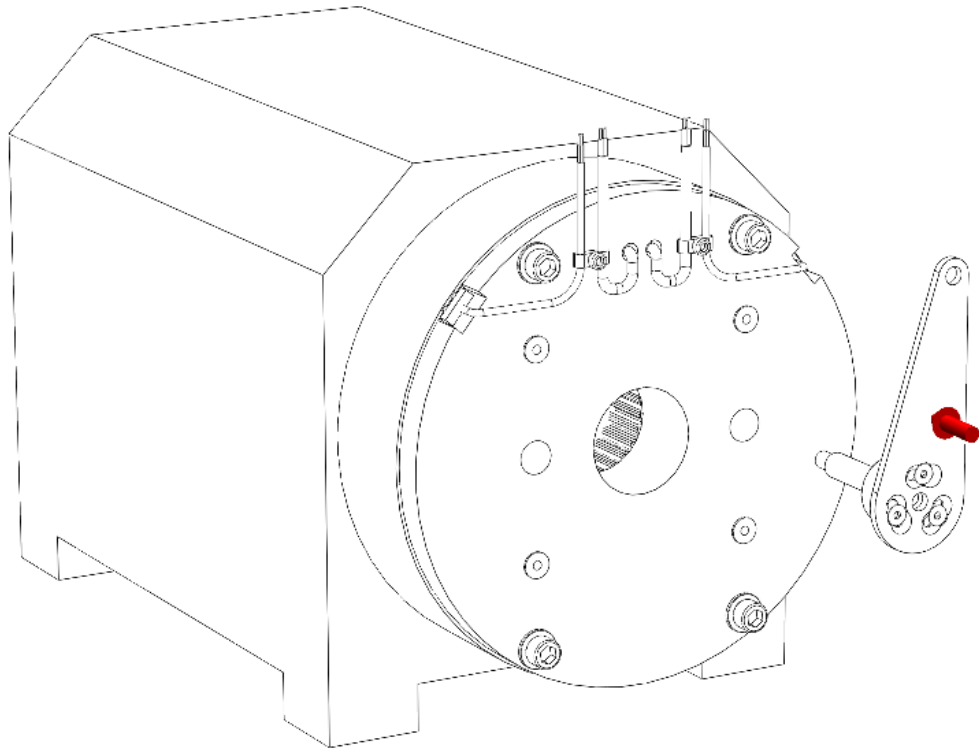


Fig. 12

- 4- Turn this, screwing the end in the mobile plate as far as it will go.



The right hand lever is screwed in clockwise, and the left hand lever is screwed in anticlockwise.

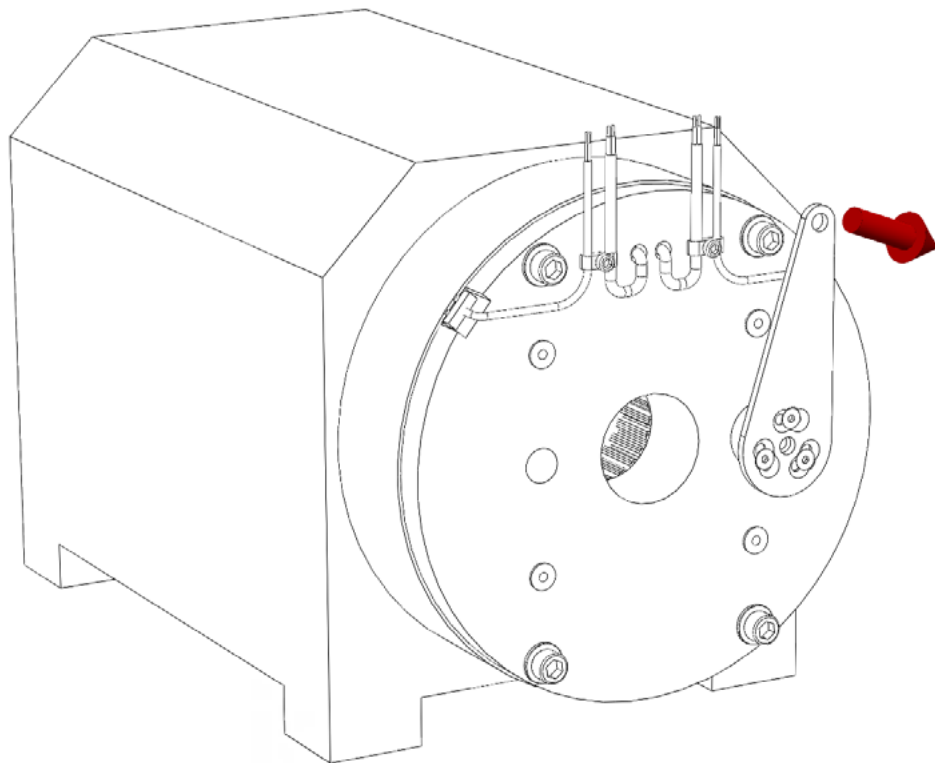


Fig. 13

- 5- Remove the handle by loosening the fixing screws.

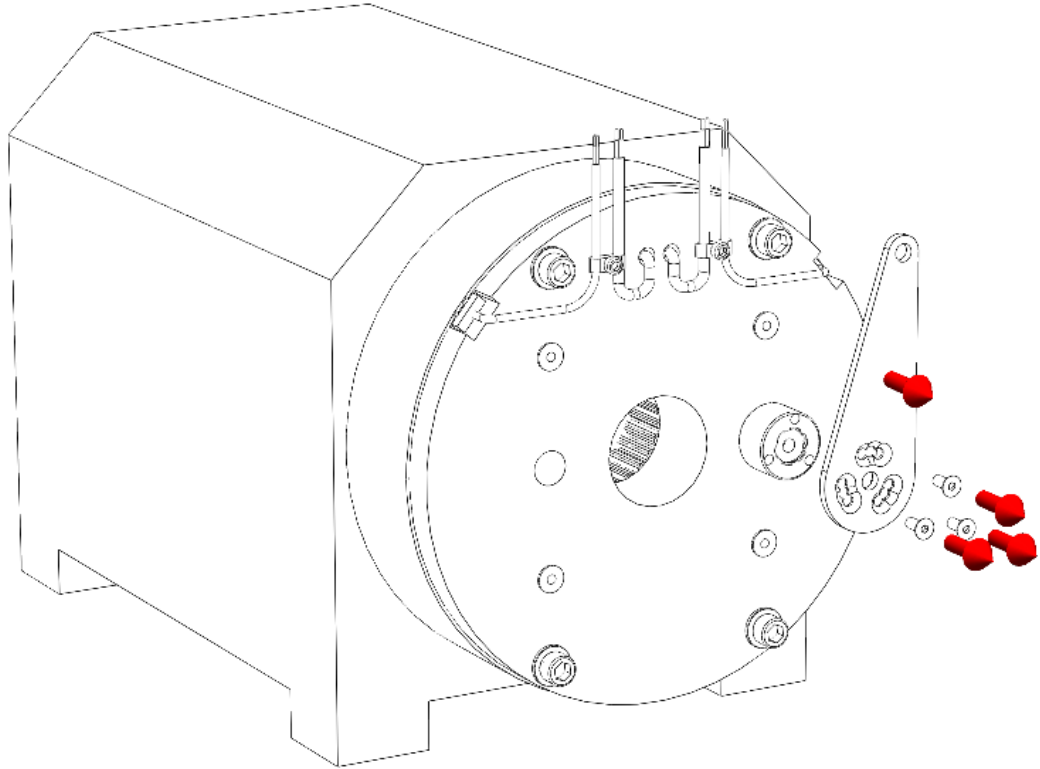


Fig. 14

- 6- Repeat the operation with the handle on the other side (screwing in the opposite direction).

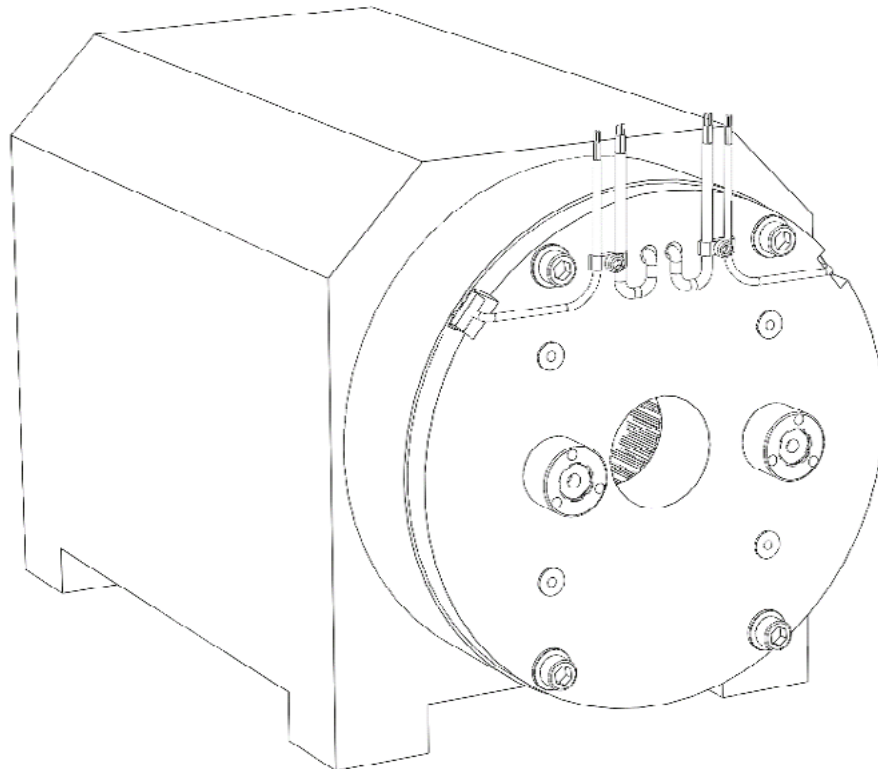


Fig. 15



Check that both hubs have one of their three holes on the upper side. Otherwise extract the hub, turn it slightly and relocate it. Repeat this operation until the position of the screwed hub does not show any of its holes on the upper side.

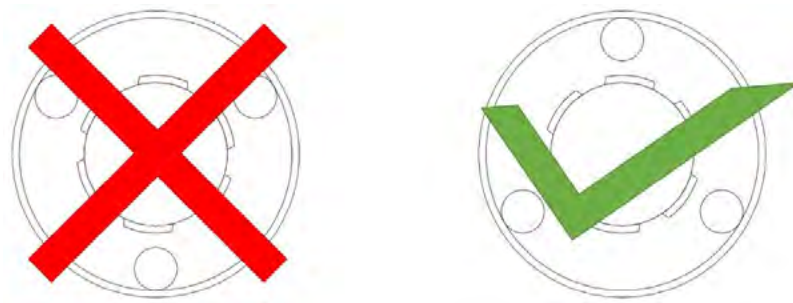


Fig. 16

7- Mount the bolt, DIN 985 M8 release nut and the washer onto the handles.

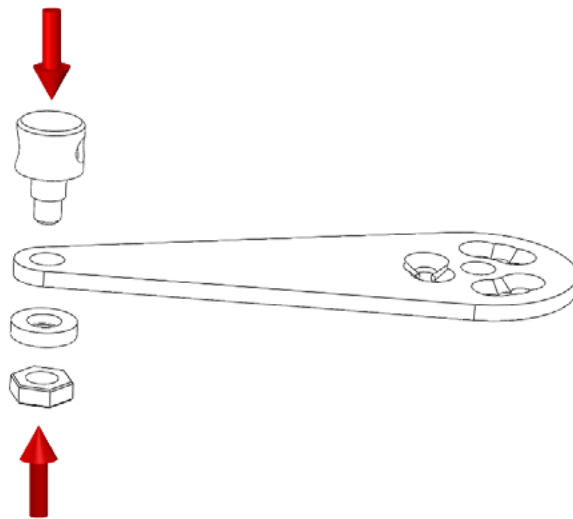


Fig. 17

8- Position the handles appropriately and clamp them with DIN7991 M6x12 screws.

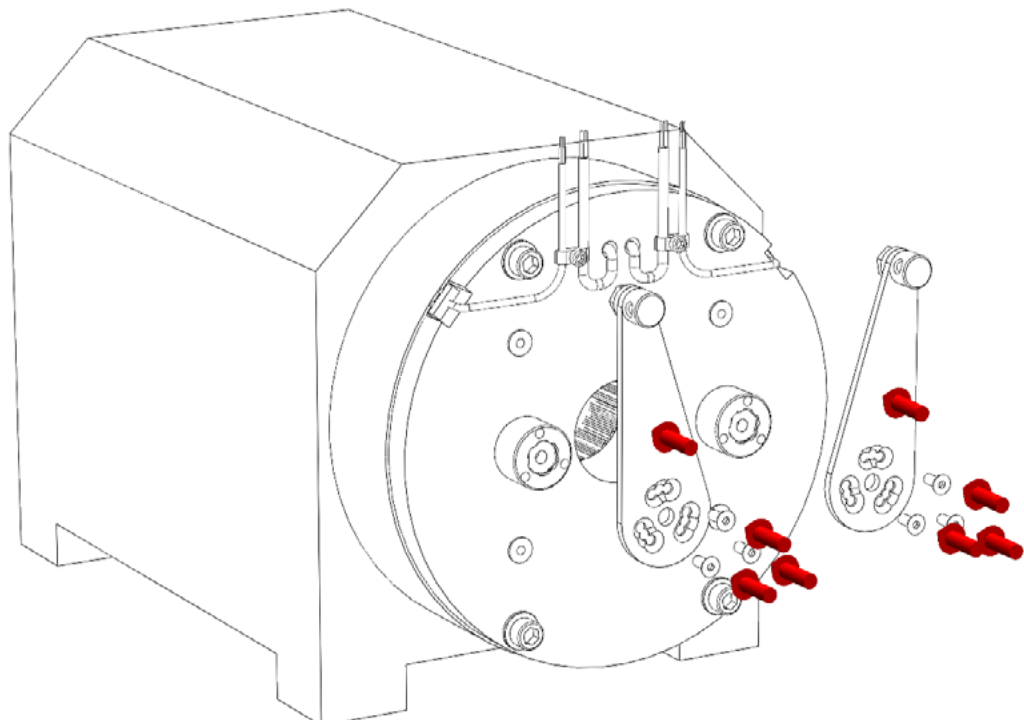


Fig. 18



Check that, without using force, that it is possible to turn both handles slightly (approximately 4 degrees).

- 9- In the *manual release levers*, not in the *Bowden release levers*, tighten the DIN 912 M8x20 central fixing screw for both levers. (In the *Bowden release levers* we recommend removing the screws).

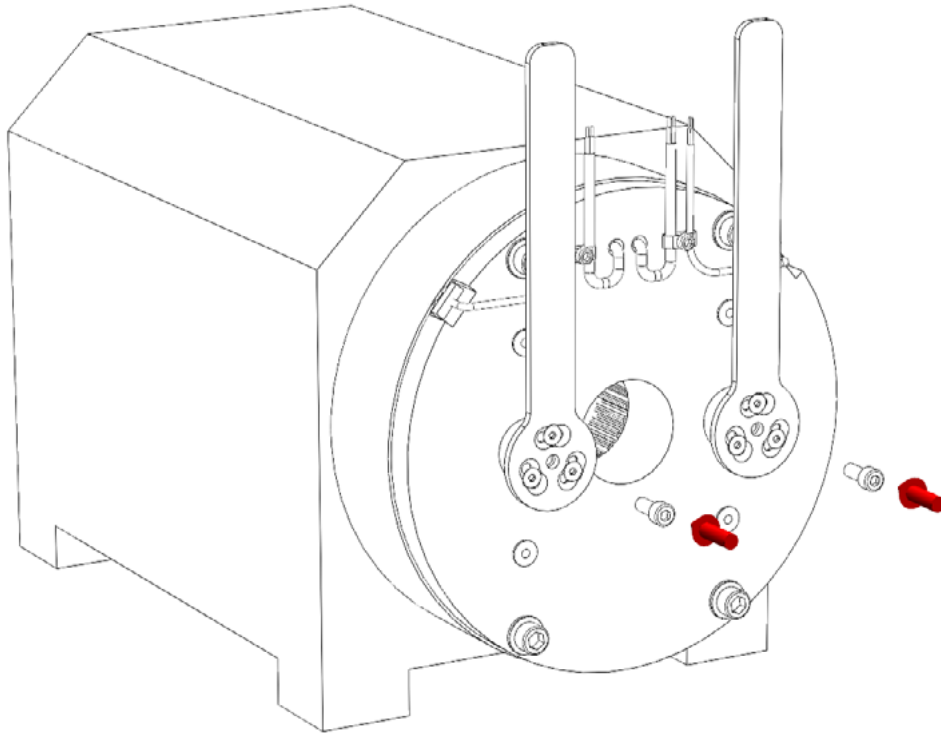


Fig. 19



To simplify the manual lever assembly process, in circumstances where this operation has to be repeated on numerous occasions, ALZOLA may make special tooling available to facilitate this task.

4 ELECTRIC INSTALLATION

4.1 Before starting:



CAUTION: Danger of electrocution.



CAUTION: Danger of the lift falling.



CAUTION: Danger of causing irreparable damage to the brake.

4.2 Tools:



Screwdriver

4.3 Brake connection:



EVO brakes are brakes that use direct current. Peaks in voltage must be prevented from damaging the winders. Varistors capable of absorbing voltage peaks must be placed in position.



Ensure that the Voltage in the grid is suited to the brake (consult the characteristics label).

EVO brakes consist of two independent electric circuits. They must be connected according to the following diagram:

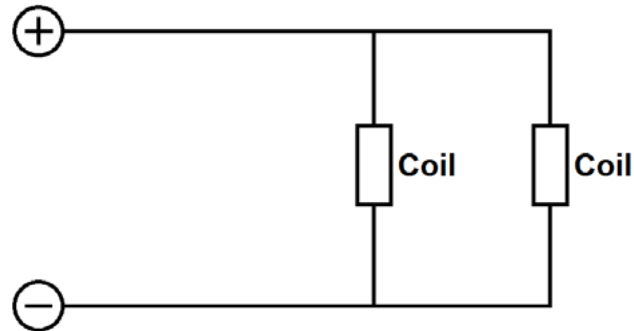


Fig. 20

4.4 Detector connection (*micro-switches*):

Connecting the optical detectors:

An incorrect connection of the detectors may cause unreparable damage to them. The detector connection diagram is as follows:

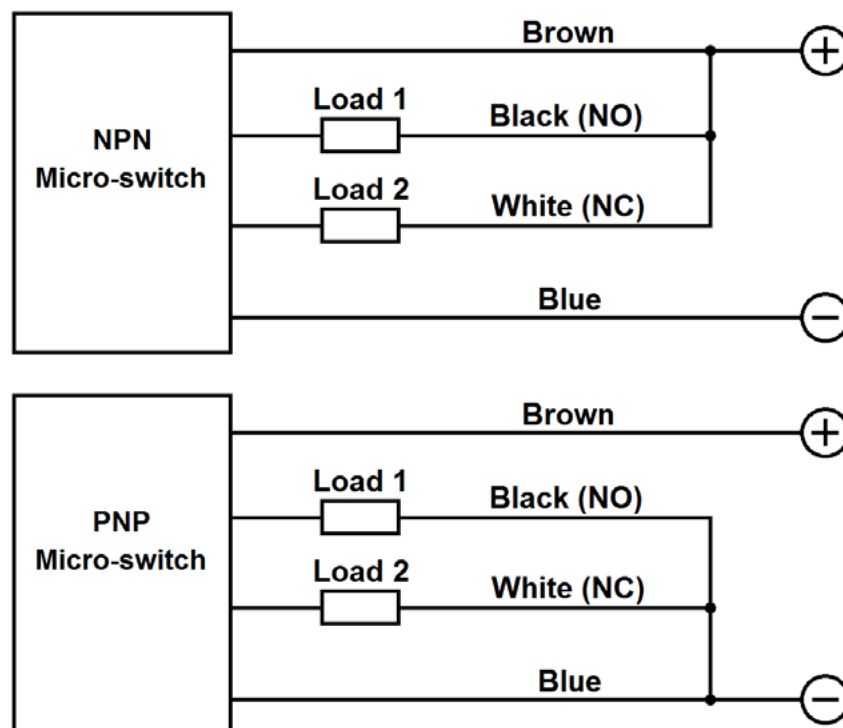


Fig. 21

These detectors are equipped with a red LED that indicates the status:

- Brake blocked: LED remains on.
- Brake released: LED remains off.

Connection of mechanical detectors:

The connection diagram for the detectors is the following:

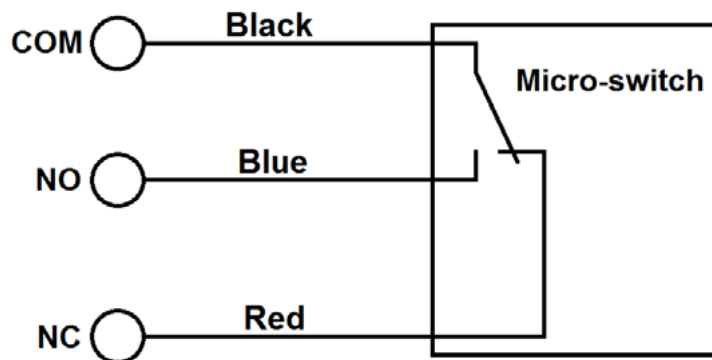


Fig. 22

5 OPERATIONAL CHECK:



Caution: Risk of the lift falling.

Run the brake. The mobile plates will be attracted by the brake casing, releasing the disc, and allowing movement of the machine axle.

Immediately disconnect the brake if you should observe:

- The brake produces a loud noise during connection/disconnection.
- The axle does not turn freely once it has been released.

Consult section 8: “*POTENTIAL FAILURES*”.

6 MAINTENANCE:

EVO brakes have been designed to function free of maintenance. In any case, we recommend checking the following points:

Operation	How often?
<i>Air-gap</i> verification	Six monthly
Detector verification	Annually
Winding verification	Annually

Table 6



Every intervention must be carried out by authorised personnel who are in possession of this manual.



During maintenance work, ensure that the braking mechanism is in standby mode and there is no risk of accidental starting up.



It is compulsory to carry out the assembly and disassembly of the *encoder* following the manufacturer's instructions.



Do not damage cables during maintenance operations.



These devices are designed to work in dry conditions. The friction sides must be totally free of oil, grease or abrasive dust that might alter their characteristics.

6.1 Air-gap verification:

Under normal operations, *gearless* machine brakes only carry out static braking, except for emergency stops. That is why under normal working conditions there should be no wearing of the brake.

In order to check the *air-gap*, the brake being blocked (braking), insert the measuring gauges between the mobile plates and the brake casing. An excessive air-gap could lead to the electromagnet not being able to release the brake. Faced with this circumstance the brake disc must be replaced (section 7.1).

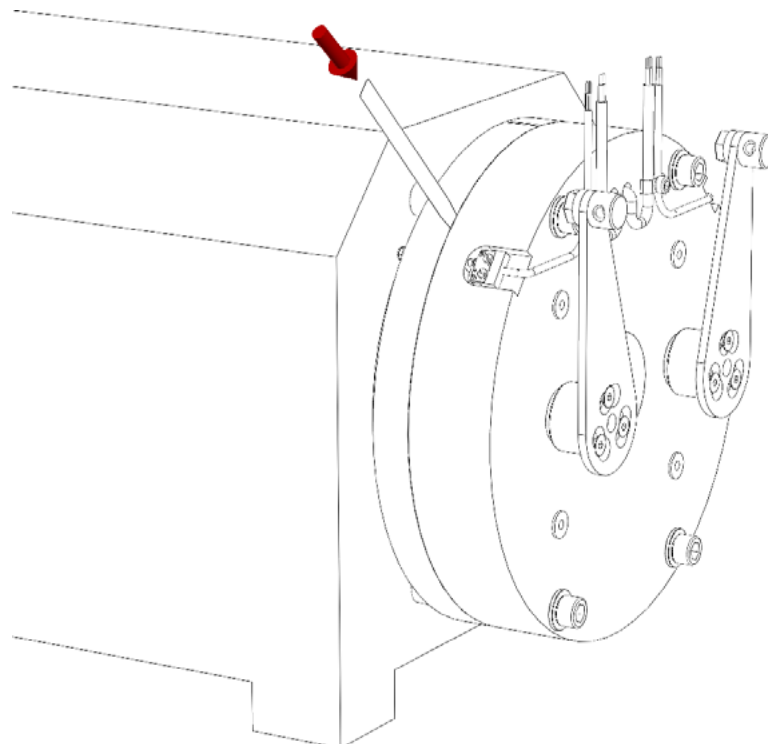


Fig. 23

6.2 Detector verification:

Mechanical detectors (*micro-switches*) are mounted on the brakes, when connecting/disconnecting the brake you must alternate the status discontinuity/continuity between the detector cables.

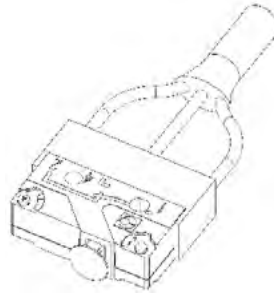


Fig. 24

In brakes that have optical detectors (*micro-switches*) mounted, on connecting/disconnecting the brake the red LED of the detector must change status.

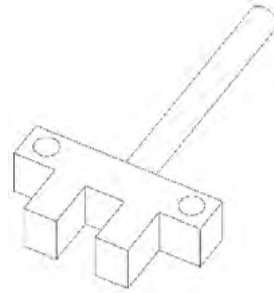


Fig. 25

Should any of the *micro-switches* not behave in the way described above it may be necessary to readjust or replace the detector. Consult point 7.2 “*Replacement and adjustment of detectors (micro-switches)*”.

Check that the detector is clean.

Check that the rubber dust-cover fits and prevents the insertion of particles or light (in the case of optical *micro-switches*) in the detector.



Exposing of the microswitches to silicon gas may cause their dysfunction.

6.3 Winding verification:

Checking the resistance: Check that the resistance of the winding is correct. A reading below that shown on the characteristics plate will be a sign that the winding has been damaged. In this case it will be necessary to replace the brake as a whole. Consult the nominal value of the resistance in section 1.5 “*General characteristics*”.

7 SPARE PARTS:

Spare parts are considered to be those components that may be replaced in the installation of the lift without prejudice to the safety of the brake.

7.1 Disc replacement:



Danger: the following process leads to releasing the brake, with the consequent risk of uncontrolled movement of the lift cabin and the counterweight.



Danger of entrapment.



Carrying out this process may require prior withdrawal of the *encoder* and subsequent assembly and readjustment.

1. Once the installation has been secured, remove the plastic caps and position and tighten the shipping screws, painted red, to avoid the brake dismantling.

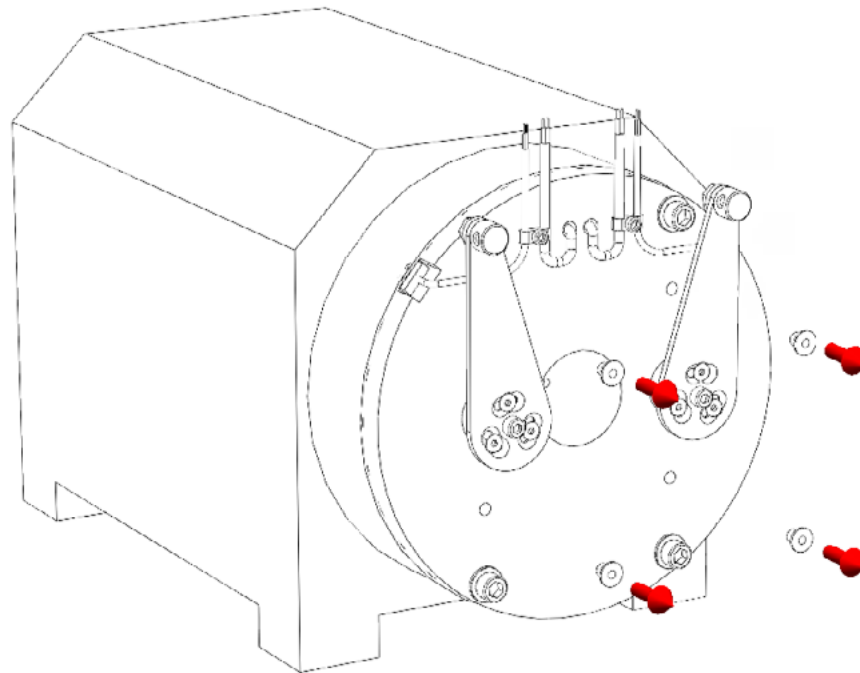


Fig. 26

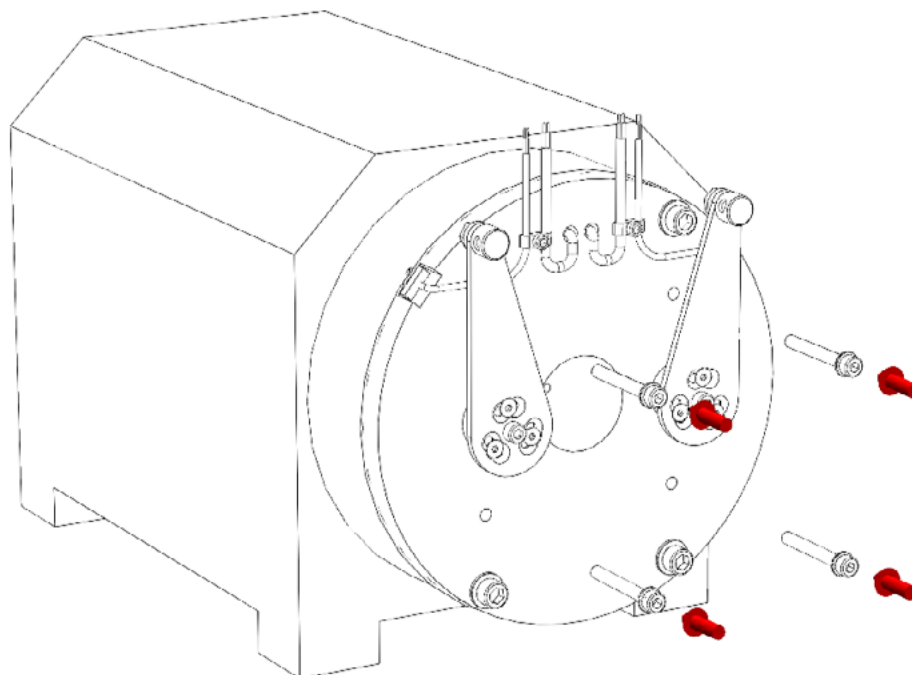


Fig. 27

2. Disconnect the power cables of the brake and the detectors.
3. Remove the fixing screws of the brake and extract it.

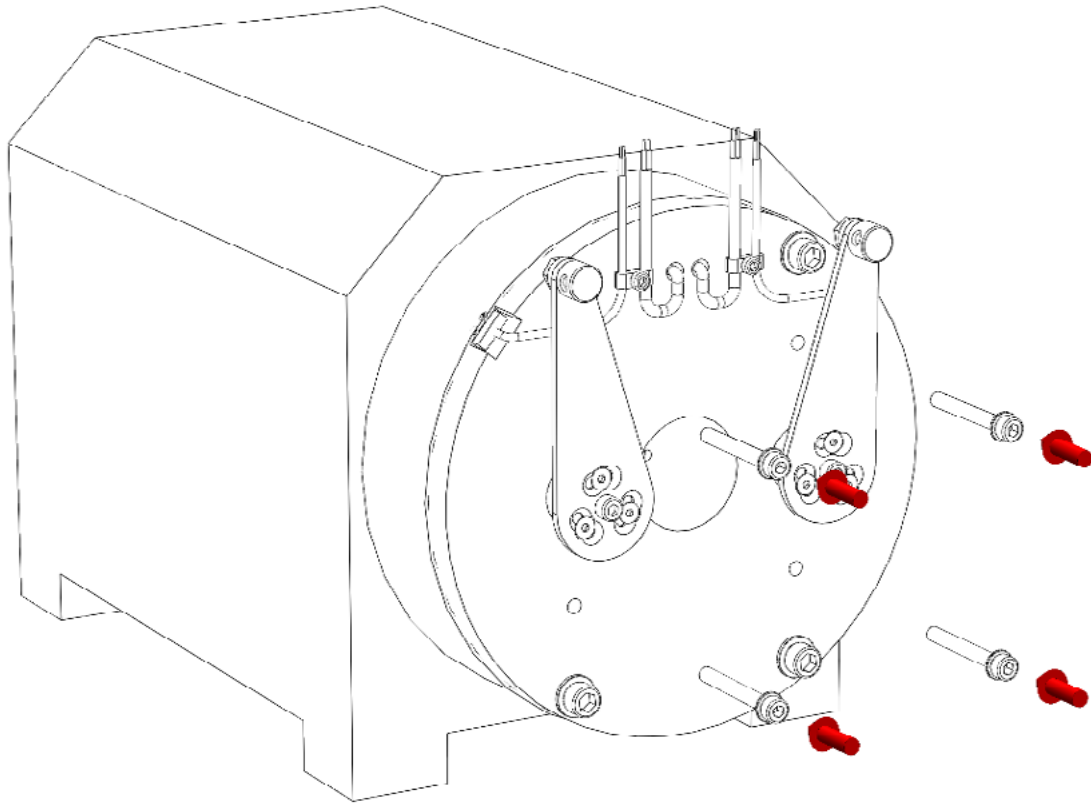


Fig. 28

4. Extract the disc to be replaced. In the diagram find the series number and model. With this data request a replacement from ALZOLA.
5. Reassemble the brake according to the instructions in section 3.3 and the following sections.
6. Remove the shipping screws, and, in the holes, insert the initially removed caps again.
7. Following the disc replacement check the detectors work correctly (section 6.2), adjust them if necessary (section 7.2).

7.2 Replacement and adjustment of detectors (*micro-switches*):



Danger of lift falling: During the operation described in this section the brake will be released allowing the uncontrolled movement of the cabin.



Danger of entrapment.



The reference for the mechanical detector is *D2SW-01MS* by OMRON®.







The references for the standard optical detectors mounted on EVO brakes are *EE-SX950-R* (NPN) and *EE-SX950P-R* (PNP), both by OMRON®.

Tools:



Allen Keys.

-  Spanner size 10 (2 units).
-  Torque wrench.
-  Feeler gauge
-  Multimetre (only for mechanical *micro-switches*)

Failure of one or both detectors will cause, despite the fact that the brake may be working correctly, the manoeuvre to incorrectly detect the changes of status of the brake, and to stop the installation. The failure may be due to a maladjustment of the actuator screw, which will require the readjustment of the detector, or may be due to the detector breaking, which will require it to be replaced. Below is a description of both processes.

▪ **Replacement of detectors (both optical and mechanical):**

1. Remove the defective detector by unscrewing the fixing screws and the staple that clamps the cable.

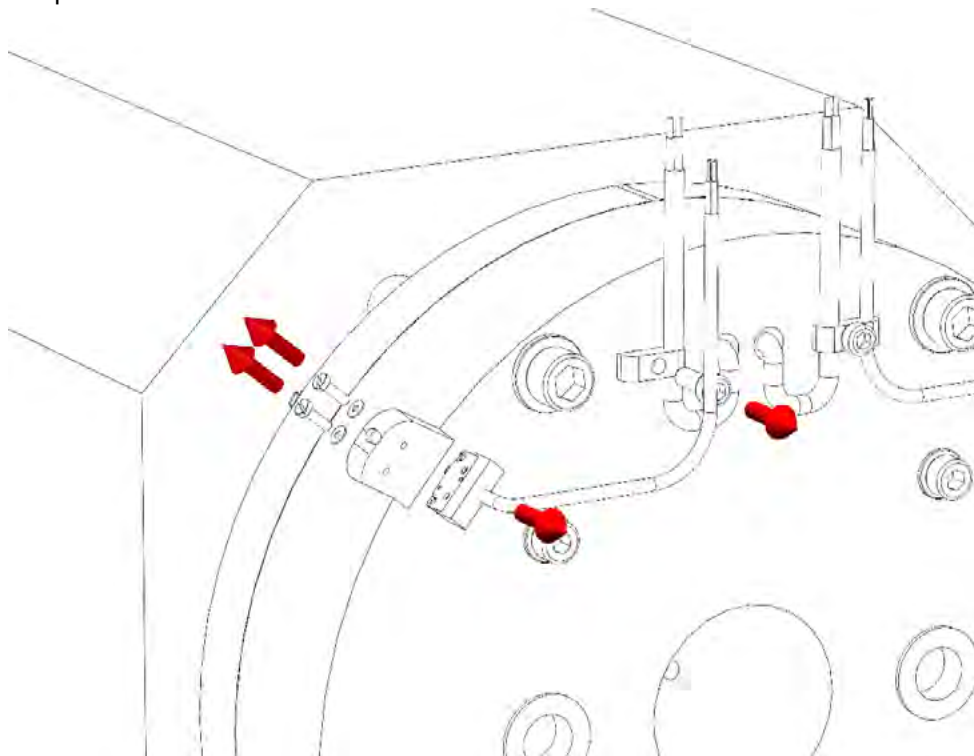


Fig. 29

2. Put the new detector in position. In the case of mechanical detectors, ensure that the actuator screw is facing the button. In the case of optical detectors, pass the cable through the orifice in the brake casing.

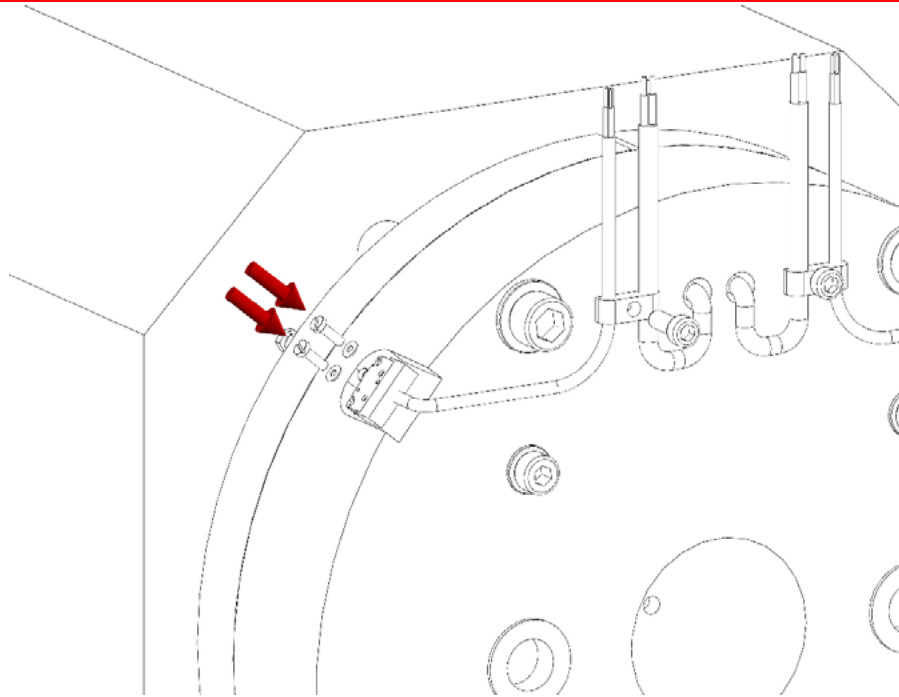


Fig. 30

3. Clamp the detector in position. In the case of mechanical detectors, using DIN84 M2.5x10 screws and DIN125 M2.5 washers with a tightening torque of 0.23N·m. In the case of optical detectors, using DIN84 M3x10 screws with a tightening torque of 0.59N·m it is recommended that the screw heads be sealed. Clamp the cable using the staple provided.

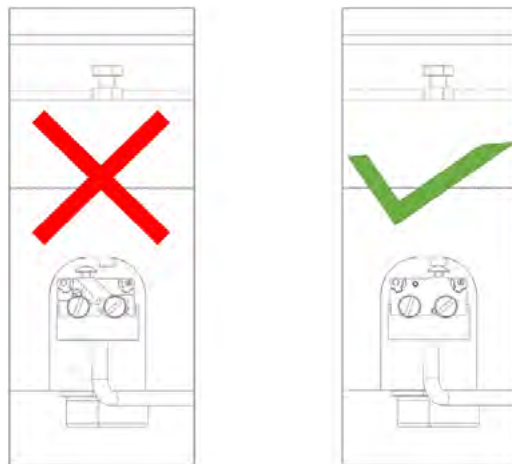




Fig. 31

4. Proceed to adjust the detectors according to the procedure described below.
 - **Adjust the detectors (both optical and mechanical):**
 -  This operation may only be carried out with the brake mounted on the machine.
 -  If the shipping screws (red) are present, remove or loosen them.

1. Insert a 0.10mm gauge between the mobile plate and the casing of the brake, close to the detector. Connect the brake to the current.

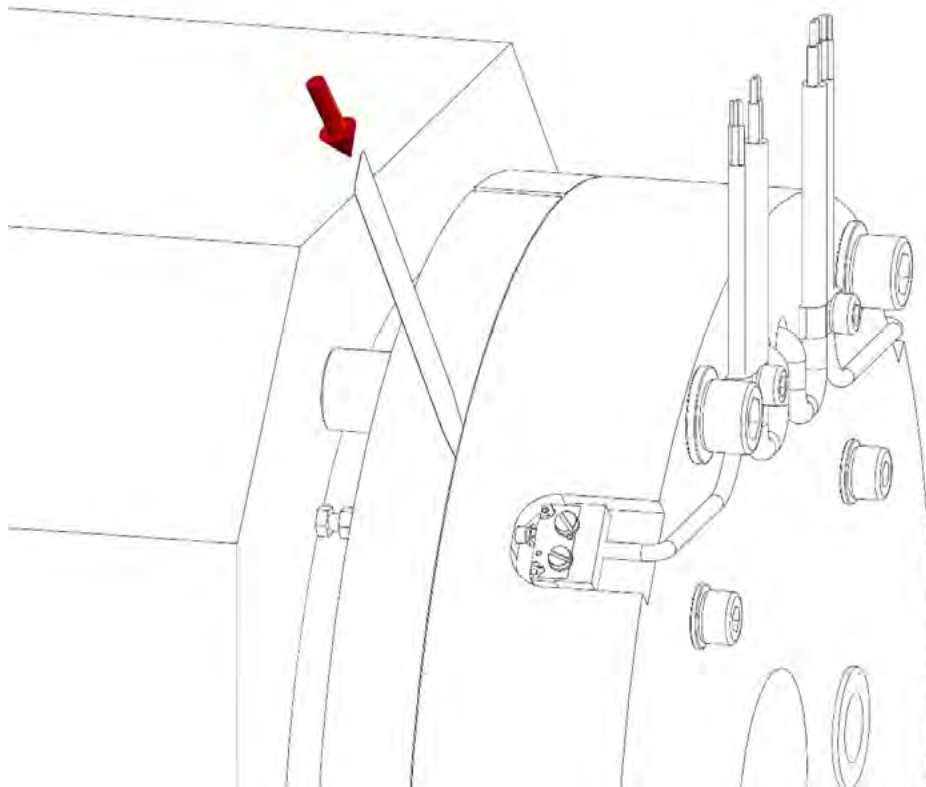


Fig. 32

Loosen the locknut and move the adjusting screw until the point where the detector is active: In the case of optical detectors the red light will switch off. In the case of mechanical detectors, continuity will be interrupted between the *micro-switch* cables.

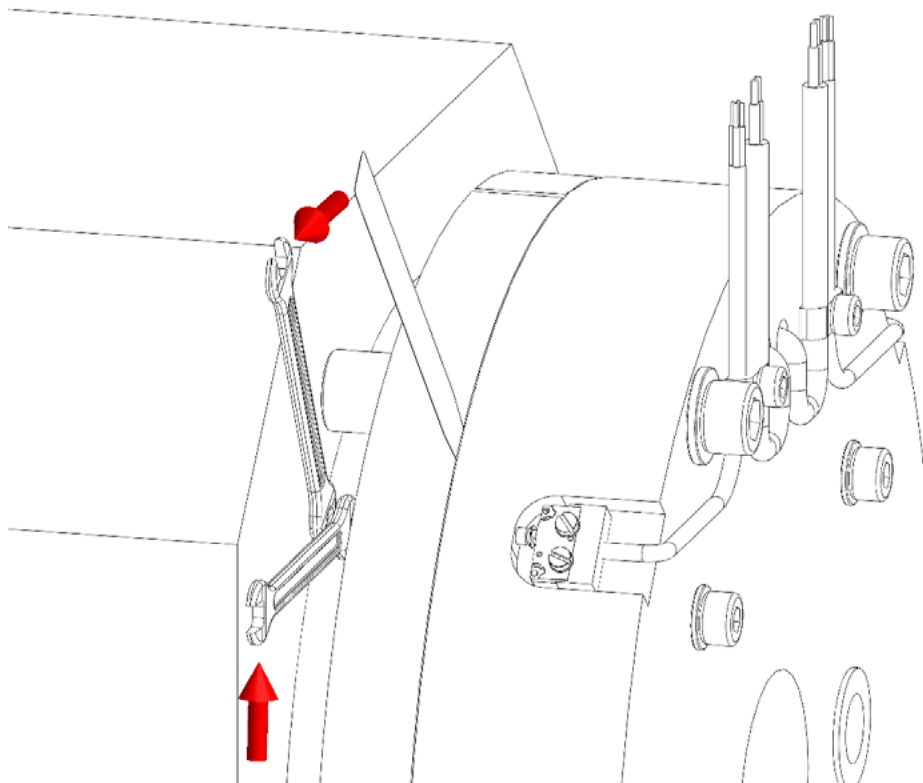


Fig. 33

2. Then tighten the locknut of the adjusting screw.

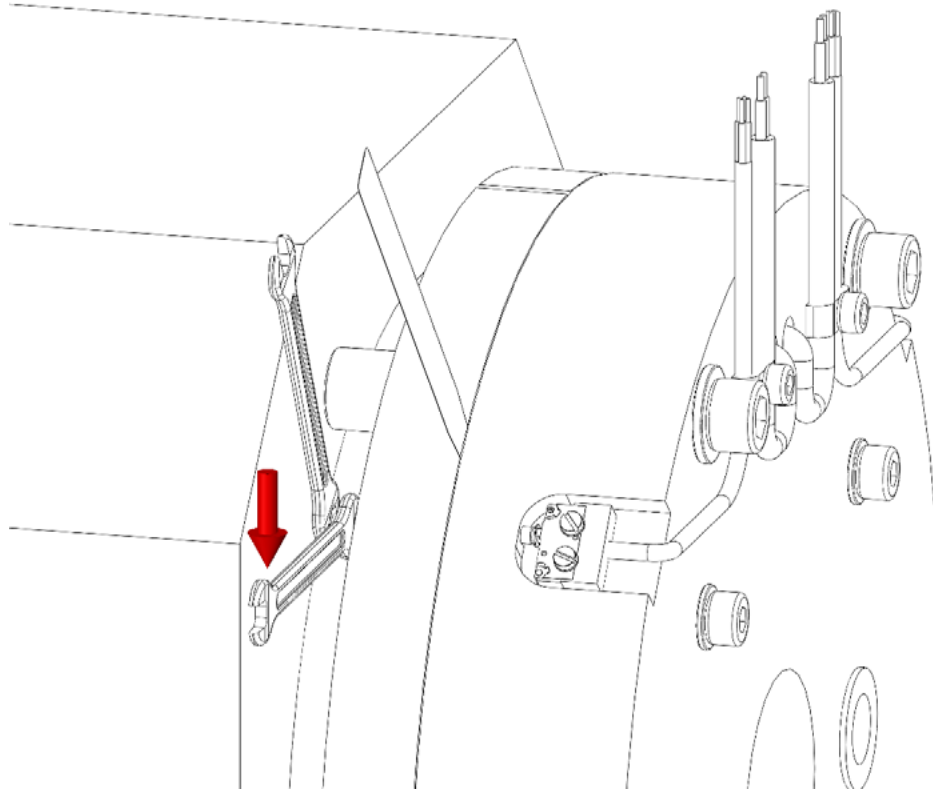


Fig. 34

3. Activate and deactivate the brake repeatedly, even with the gauge in the previous position, it works correctly.

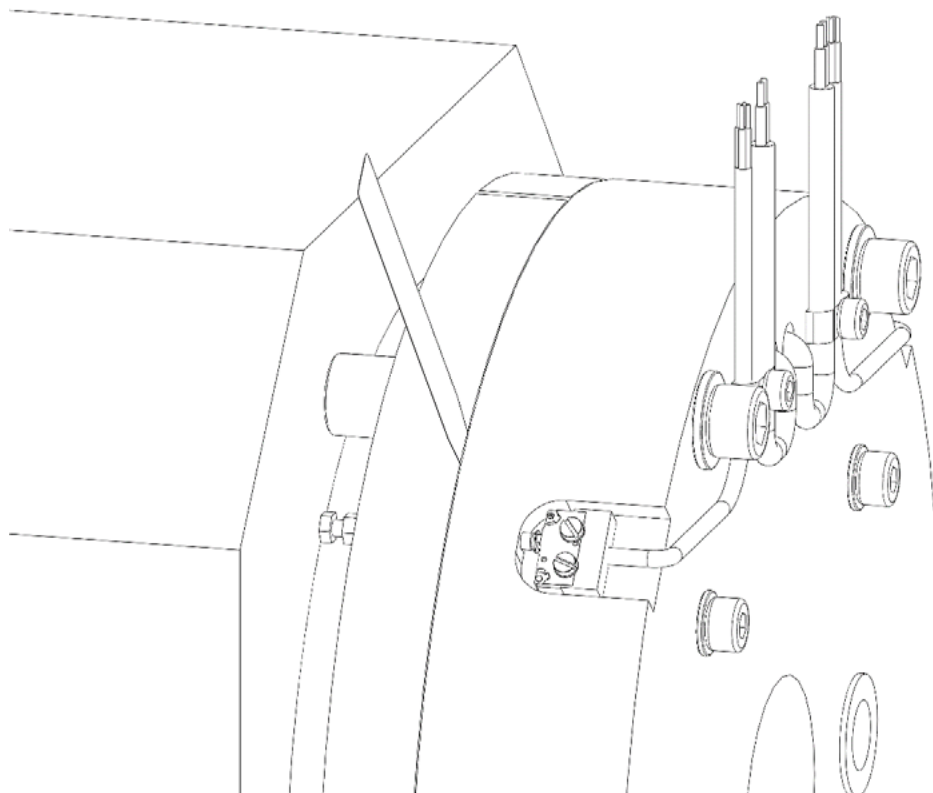


Fig. 35

4. Extract the gauge from its position (with no power in the brake), and insert it (powering the brake) between the disc and the mobile plate. Then disconnect the brake.

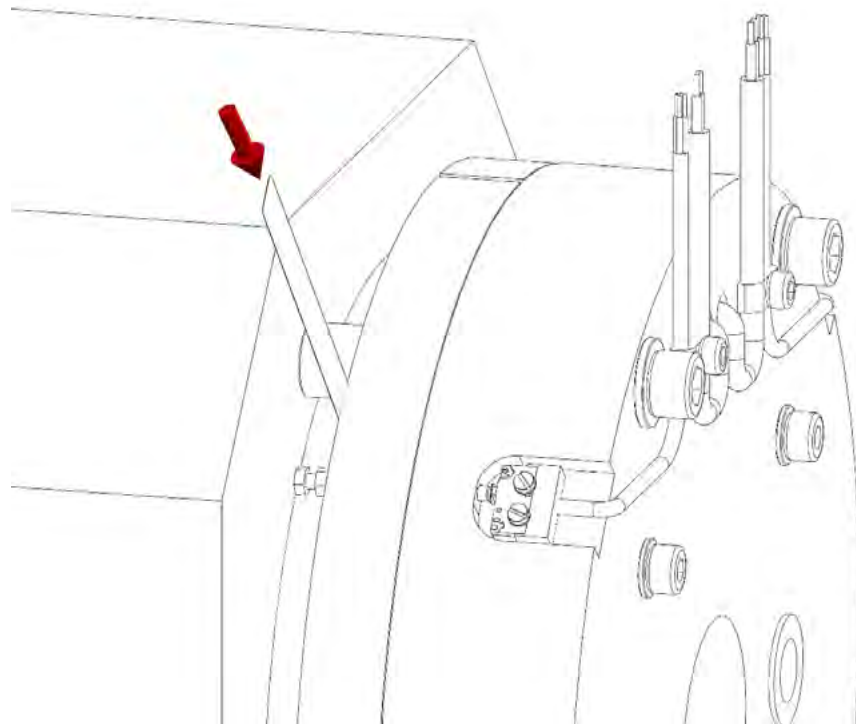


Fig. 36

5. Check that the detector is deactivated: In the case of the optical detector, where the *micro-switch* light is on. In the case of the mechanical detector check that there is continuity between the *micro-switch* cables.
6. Activate and deactivate the brake repeatedly to check that, even with the gauge in the previous position, it works correctly.

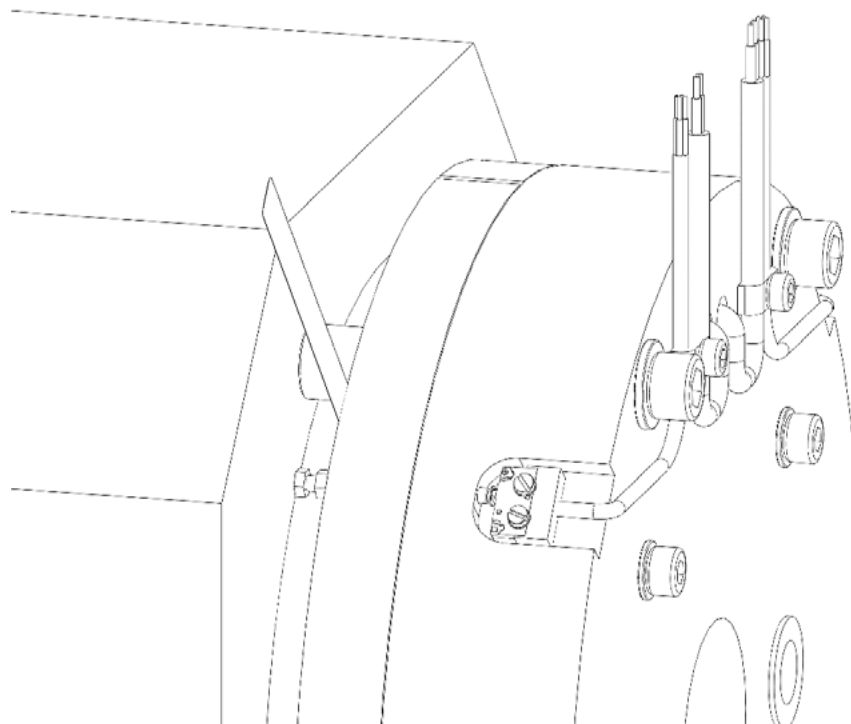


Fig. 37

7. If correct operation cannot be achieved, repeat the adjustment process from step 1.

7.3 Replacement of the manual release lever:

1. Extract the lever to be replaced by turning it so that it goes away from the opposite lever.

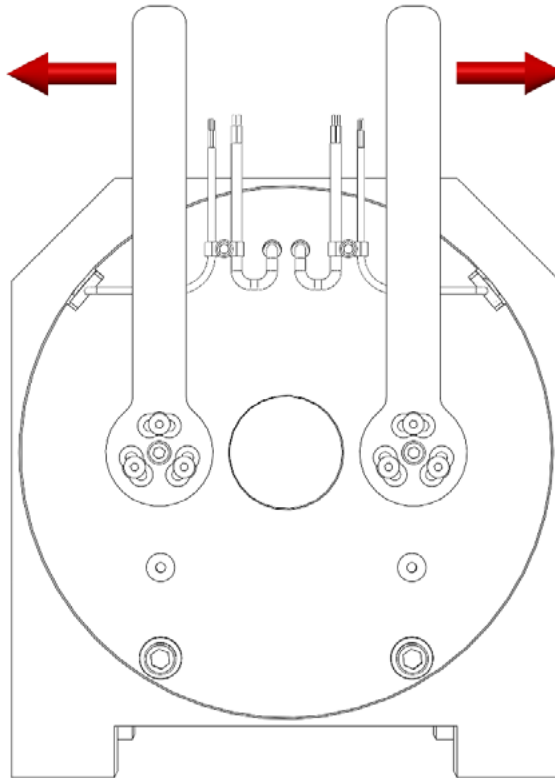


Fig. 38

Remember that the threading of each lever is in the opposite direction.

2. For assembly of a new lever follow the procedure explained in section 3.7 of the manual.

8 POTENTIAL FAILURES:

Failure	Possible reasons	Solutions
The brake does not work.	Wrong Voltage.	Apply the correct voltage.
	<i>Air-gap</i> too large (disc deteriorated).	Replace the rotor.
	Coil broken.	Replace the brake.
	<i>Micro-switch</i> broken.	Change the <i>micro-switch</i> .
	<i>Micro-switch</i> badly adjusted.	Adjust the <i>micro-switch</i> .
The brake is slow to react in the case of an emergency stop.	The brake is connected to an alternating current.	Connect to the direct current.
The brake does not release.	Particles stop the casing from moving.	Replace brake.
The torque is insufficient.	Greasy disc.	Clean disc support and replace the disc.
The brake is very noisy.	<i>Air-gap</i> too large.	Replace disc.
The brake gets too hot.	Wrong Voltage.	Apply the correct voltage.
	The winding is short-circuited.	Replace the brake.
The release lever turns.	Tightening torque is insufficient.	Tighten (See table 3.1).

Table 7



TRANSFORMATIONS ELECTROMECAÑICAS ALZOLA S.L.

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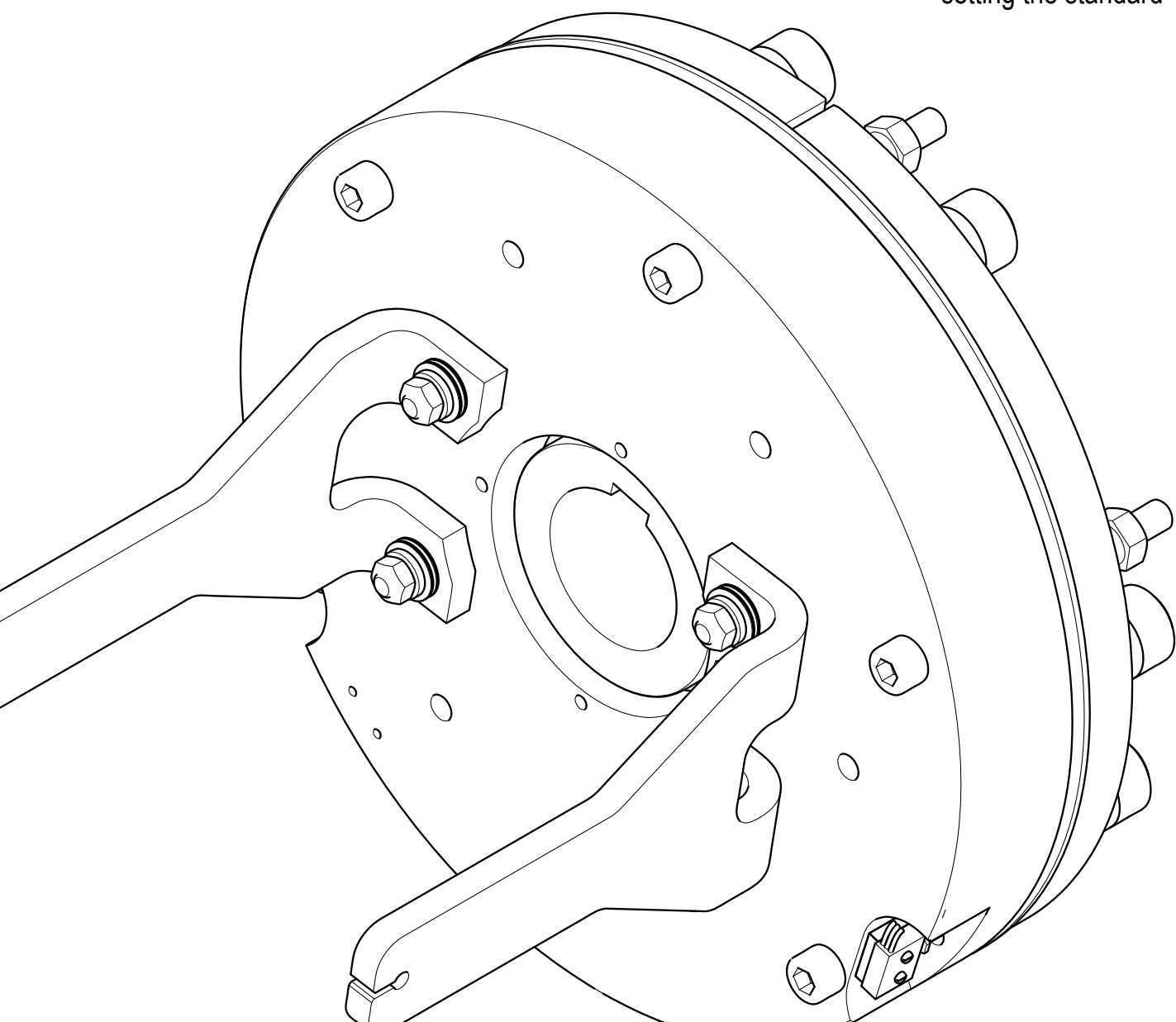


Management
System
ISO 9001:2008

www.tuv.com
ID 0.04.15191

INTORQ

setting the standard



INTORQ BFK464

Electromagnetically released spring-applied brake

Operating Instructions

www.intorq.com

This documentation only applies to:

- BFK464-17S

- BFK464-18S

- BFK464-18S.2

- BFK464-19S

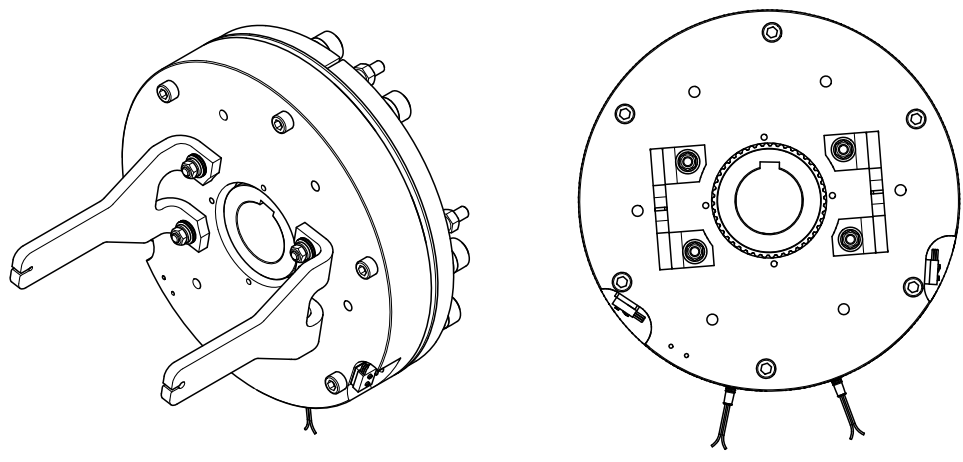
- BFK464-20S

- BFK464-20S.1

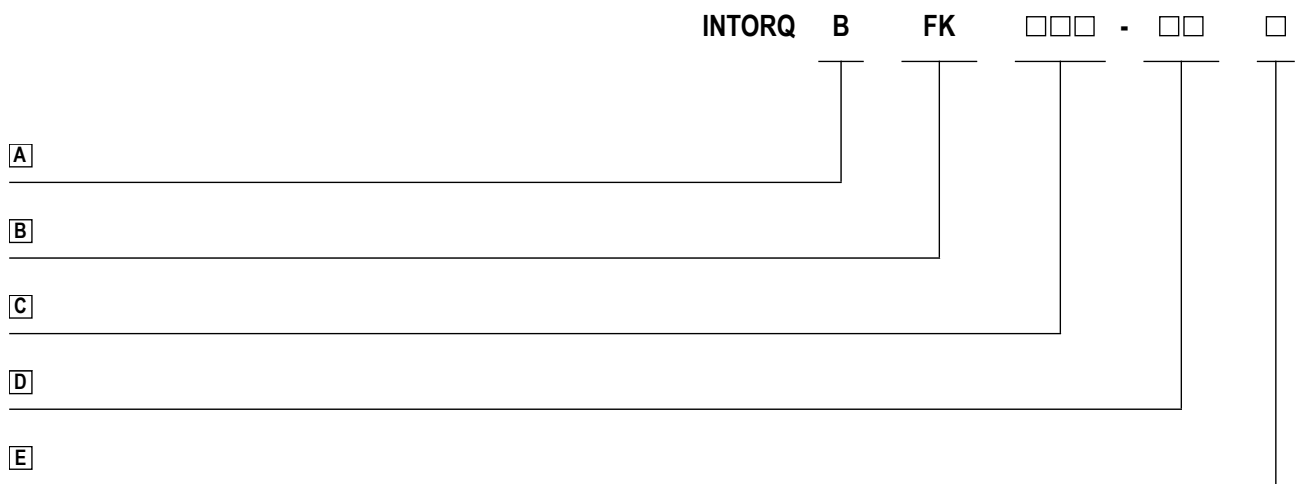
- BFK464-25S

- BFK464-25S.1

- BFK464-28S



Product key



Legend for the product key

INTORQ BFK464

A	Product group	Brakes
B	Product type	Spring-applied brake
C	Type	464
D	Size	17, 18, 19, 20, 25, 28
E	Design	S S.1 S.2

Not coded: Supply voltage, hub bore, options

Identification

Packaging label			Example
Manufacturer	Bar code		<p>INTORQ D-Aerzen Typ: BFK464-25S Nr.: 12345678 FEDERKRAFTBREMSE 1 Stück 205/103 V DC 600/600 NM 24.11.09 300/75 W 55 H7 0036 ABV/851 Rostschutzverpackung, Reliöflöche fettfrei halten. CE</p>
Type (see product key)	Type No.		
Designation	Qty. per box		
Rated/holding voltage	Rated torque	Packaging date	
Rated/holding power	Hub diameter		
Model identification			
Note	CE mark		

Name plate			Example
Manufacturer	Model identification	CE marking	<p>INTORQ D-Aerzen 0036 ABV/851 BFK464-25S 205/103 V DC 300/75 W 55H7 CE Nr.:12345678 600/600NM 24.11.09</p>
Type (see product key)			
Designation			
Rated/holding voltage	Rated/holding power	Hub diameter	
Type No.	Rated torque	Date of manufacture	

Document history

Material number	Version			Description
13348276	1.0	09/2010	TD09	First edition
33000116	2.0	11/2010	TD09	Enlarged to include 19S and 28S sizes Supplement of the tables in the Characteristics chapter Supplement of the important instructions in the Commissioning and operation chapter
33002148	3.0	08/2012	TD09	Supplement of the model identification number for the sizes 18S, 19S and 28S Revision of the operating times Supplemented by versions 18S.2 and 25S.1 Change of the phone and fax number as well as the cover page and back
33002149	4.0	06/2014	SC	New construction FM, supplement of the size 17S

Contents

1	Preface and general information.....	5
1.1	About these Operating Instructions.....	5
1.2	Terminology used.....	5
1.3	Conventions in use.....	5
1.4	Abbreviations used.....	6
1.5	Safety instructions and notices.....	7
1.6	Scope of delivery.....	8
1.7	Disposal.....	8
1.8	Drive systems.....	9
1.9	Legal regulations.....	9
2	Safety instructions.....	10
2.1	General safety instructions.....	10
2.2	Application as directed.....	11
3	Technical specifications.....	12
3.1	Product description.....	12
3.2	Rated data.....	15
3.3	Rating (design data).....	17
3.4	Switching energy / operating frequency.....	18
3.5	Emissions.....	19
4	Mechanical installation.....	20
4.1	Important notes.....	20
4.2	Necessary tools.....	20
4.3	Assembly.....	21
4.4	Installation procedure.....	22
5	Electrical installation.....	30
5.1	Electrical connection.....	30
5.2	Bridge/half-wave rectifiers (optional).....	31
5.3	Electrical connection.....	34
6	Commissioning and operation.....	35
6.1	Important notes.....	35
6.2	Function checks before commissioning.....	35
6.3	Commissioning.....	37
6.4	During operation.....	38
7	Maintenance and repair.....	39
7.1	Wear of spring-applied brakes.....	39
7.2	Inspections.....	40
7.3	Maintenance.....	41
7.4	Spare-parts list.....	43
7.5	Ordering spare parts.....	44
8	Troubleshooting and fault elimination.....	45

1 Preface and general information

1.1 About these Operating Instructions




- These Operating Instructions will help you to work safely with the spring-applied brake with electromagnetic release. They contain safety instructions that must be followed.
- All persons working on or with the electromagnetically released spring-applied brakes must have the Operating Instructions available and observe the information and notes relevant for them.
- The Operating Instructions must always be in a complete and perfectly readable condition.

1.2 Terminology used

Term	In the following text used for
Spring-applied brake	Spring-applied brake with electromagnetic release
Drive system	Drive systems with spring-applied brakes and other drive components

1.3 Conventions in use

This document uses the following styles to distinguish between different types of information:

Spelling of numbers	Decimal separator	Point	The decimal point is always used. For example: 1234.56
Symbols	Page reference		Reference to another page with additional information For example:  16 = refer to page 16
	Wildcard	<input type="checkbox"/>	Wildcard for options, selections For example: BFK458- <input type="checkbox"/> <input type="checkbox"/> = BFK458-10
	Notice		Important notice about ensuring smooth operations or other key information.

1.4 Abbreviations used




Letter symbol	Unit	Designation
I	A	Current
I_N	A	Rated current, at 20 °C and rated voltage
M_A	Nm	Tightening torque of fixing screws
M_K	Nm	Rated torque of the brake, rated value at a relative speed of rotation of 100 rpm
n_{max}	rpm	Maximum occurring speed of rotation during the slipping time t_3
P_N	W	Rated coil power, at rated voltage and 20 °C
Q	J	Quantity of heat/energy
Q_E	J	Maximally permissible friction energy for one-time switching, thermal parameter of the brake
Q_R	J	Braking energy, friction energy
Q_{zul}	J	Max. permissible friction work per switching cycle
R_N	Ohms	Rated coil resistance at 20 °C
S_h	1/h	Operating frequency: the number of switching operations evenly spread over the time unit
S_{hue}	1/h	Transition operating frequency, thermal parameter of the brake
S_{hzul}	1/h	Max. permissible switching frequency
s_L	mm	Air gap: the lift of the armature plate while the brake is switched
s_{LN}	mm	Rated air gap
s_{Lmin}	mm	Minimum air gap
s_{Lmax}	mm	Maximum air gap
t_1	ms	Engagement time, sum of the delay time and braking torque - rise time $t_1 = t_{11} + t_{12}$
t_2	ms	Disengagement time, time from switching the stator until reaching 0.1 M_K
t_3	ms	Slipping time, operation time of the brake (according to t_{11}) until standstill
t_{11}	ms	Delay during engagement (time from switching off the supply voltage to the beginning of the torque rise)
t_{12}	ms	Rise time of the braking torque, time from the start of torque rise until reaching the braking torque
U	V	Voltage

1.5 Safety instructions and notices








The following icons and signal words are used in this document to indicate dangers and important safety information:

Safety instructions

Structure of safety instructions:

	 SIGNAL WORD
 	<p>Icon Indicates the type of danger</p> <p>Signal word Characterises the type and severity of danger.</p> <p>Note Describes the danger</p> <p>Possible consequences <ul style="list-style-type: none"> ■ List of possible consequences if the safety instructions are disregarded. </p> <p>Protective measure <ul style="list-style-type: none"> ■ List of protective measures to avoid the danger. </p>

Danger level

	 DANGER
	<p>DANGER indicates a hazardous situation which, if not avoided, <i>will</i> result in death or serious injury.</p>
	 WARNING
	<p>WARNING indicates a potentially hazardous situation which, if not avoided, <i>could</i> result in death or serious injury.</p>
	 CAUTION
	<p>CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p>
	<p>NOTICE</p> <p>Notice about a harmful situation with possible consequences: the product itself or surrounding objects could be damaged.</p>

1.6 Scope of delivery

- The drive systems are put together using a modular system in accordance with the customers' wishes. The items included in the delivery can be found in the associated accompanying paperwork.
- After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. INTORQ does not accept any liability for deficiencies claimed subsequently.
 - Claim visible transport damage immediately to the deliverer.
 - Claim visible deficiencies or incomplete deliveries immediately to INTORQ GmbH & Co. KG.

1.7 Disposal

The spring-applied brake consists of different types of material.

- Recycle metals and plastics.
- Ensure professional disposal of assembled PCBs according to the applicable environmental regulations.

1.8 Drive systems

Labelling

Drive systems and components are unambiguously designated by the indications on the name plate.

Manufacturer: INTORQ GmbH & Co. KG, Wülmser Weg 5, D-31855 Aerzen, Germany

- The spring-applied INTORQ brake is also delivered in single modules which can then be put together by the customer according to their requirements. The specifications – particularly the packaging label, name plate and type code – apply to a complete stator.
- The labelling is not included when modules are delivered individually.

1.9 Legal regulations

Liability

- The information, data and notes in these Operating Instructions met the state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from this information, illustrations and descriptions.
- We do not accept any liability for damage and operating interference caused by:
 - inappropriate use
 - unauthorised modifications to the product
 - improper work on or with the drive system
 - operating errors
 - disregarding the documentation

Warranty

- Terms of warranty: Refer to the terms of sale and delivery for INTORQ GmbH & Co. KG.
- Warranty claims must be made to INTORQ immediately after the defects or faults are detected.
- The warranty is void in all cases when liability claims cannot be made.

2 Safety instructions

2.1 General safety instructions

- INTORQ components ...
 - ... must only be used as directed.
 - ... must not be commissioned if they are noticeably damaged.
 - ... must not be technically modified.
 - ... must not be commissioned if they are incompletely mounted or connected.
 - ... must not be operated without the required covers.
 - ... can hold live as well as moving or rotary parts during operation according to their degree of protection. Surfaces may be hot.
- For INTORQ components ...
 - ... the documentation must always be kept at the installation site.
 - ... only permitted accessories are allowed to be used.
 - ... only original spare parts of the manufacturer are allowed to be used.
- Follow all specifications and information found in the corresponding enclosed documentation. These must be followed to maintain safe, trouble-free operations and to achieve the specified product characteristics.
- Only qualified, skilled personnel are permitted to work on and with INTORQ components. According to IEC 60364 or CENELEC HD 384, qualified, skilled personnel are persons ...
 - ... who are familiar with the installation, mounting, commissioning, and operation of the product.
 - ... who have the qualifications necessary for their occupation.
 - ... who know and apply all regulations for the prevention of accidents, directives, and laws relevant on site.
- Risk of burns!
 - Surfaces may be hot during operation! Provide for protection against accidental contact.
- Risk of injury due to a rotating shaft!
 - Wait until the motor is at standstill before you start working on the motor.
- The friction lining and the friction surfaces must never contact oil or grease since even small amounts reduce the braking torque considerably.
- The brake is designed for operation under the environmental conditions that apply to IP54 protection. Because of the numerous possibilities of using the brake, it is however necessary to check the functionality of all mechanical components under the corresponding operating conditions.

2.2 Application as directed

- INTORQ components ...
 - ... are intended for use in machinery and systems.
 - ... must only be used for the purposes ordered and confirmed.
 - ... must only be operated under the ambient conditions prescribed in these Operating Instructions.
 - ... must not be operated beyond their corresponding power limits.

Any other use or excessive usage shall be deemed improper!

Applications of the INTORQ spring-applied brake

- Air humidity: no restrictions
 - If condensation and moisture are formed: Ventilate the brake sufficiently, ensure that the friction surfaces dry off quickly.
- Ambient temperature: -5 °C to +40 °C
- At high humidity and low temperature:
 - Take measures to prevent the armature plate and rotor from freezing together.
- Protect the electrical connections against contact.

3 Technical specifications

3.1 Product description

Versions

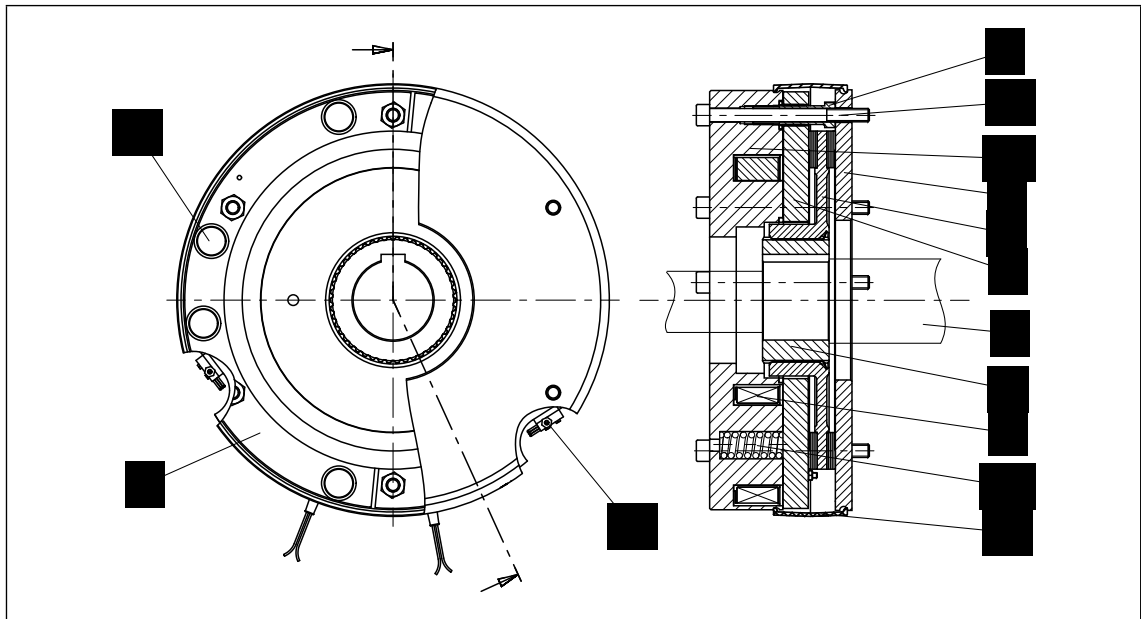


Fig. 1 Design of the BFK464-□□S / S.1 / S.2 spring-applied brake

1.1 Stator	5 Shaft	10 Socket head cap screw, DIN EN ISO 4762
1.2 Pressure springs	6 Flange (optional)	13 Cover plate (optional)
2 Armature plate	8 Coil	16 Microswitch
3 Complete rotor	9 Sleeve bolts	18 Silencer (optional)
4 Hub		

3.1.1 General information

The spring-applied brake is designed for converting mechanical work and kinetic energy into heat energy. Due to the static braking torque, loads can be held at standstill. Emergency braking is possible at high speed of rotation. The wear increases as the switching energy increases (operating speeds 17).

The BFK464 spring-applied brake is a single-disk brake with two friction surfaces. The braking torque is applied through two separate braking circuits, both electrical and mechanical, via several compression springs (1.2) in the form of generated friction. The brake circuits are released electromagnetically. Due to its division into two brake circuits, the brake is particularly suitable for applications such as lift systems and stage/platform technology. The brake can be selected based on the rated torque for one brake circuit. The second brake circuit meets the requirement for redundancy.

The division of the brake circuits is done using a 2-part armature disk (2) with the respectively allocated compression springs (1.2) and electromagnetic coils (8). Each brake circuit can be operated individually due to the separate supply lines for each coil group and armature disk segment (31). Each brake circuit has a microswitch (16) which monitors the switching state of the spring-applied brake. Using the associated switching device, the supply voltage (AC voltage) is rectified and, when the brake is released, lowered after a short period of time. This results in a reduction of the average electrical power of the brake.

The stator (1) is supplied in heat class F. The limit temperature of the coils (8) is 155 °C. The BFK464 spring-applied brake is designed for a maximum operating time of 60 % with holding current reduction.

Certificate

Type	EC type-examination certificate
BFK464-17S	ABV 948
BFK464-18S	ABV 862
BFK464-18S.2	ABV 903
BFK464-19S	ABV 863
BFK464-20S	ABV 849
BFK464-20S.1	ABV 850
BFK464-25S	ABV 851
BFK464-25S.1	ABV 869
BFK464-28S	ABV 859

3.1.2 Braking

During the braking procedure, the pressure springs (1.2) use the armature plate (2) to press the rotor (3) (which can be shifted axially on the hub (4)) against the friction surface. The asbestos-free friction linings ensure high braking torque and low wear. The braking torque is transmitted between the hub (4) and the rotor (3) via gear teeth.

3.1.3 Brake release

When the brakes are applied, an air gap "s₁" is present between the stator (1) and the armature plate segment (1). To release the brake, the coils (8) of the existing magnetic circuit are supplied with the correct DC voltage. The resulting magnetic force works against the spring force to draw the armature plate segments (1) to the stator (7). This releases the rotor (3) from the spring force and allows it to rotate freely

3.1.4 Release monitoring

The spring-activated brake has a microswitch (16) for each braking circuit to monitor the switching state. When the brake is released, the microswitches (16) toggle. This means that it is possible to exclude the drive being operated when the brake is closed. The microswitches can be connected as both normally open and also normally closed.

To check that the microswitches function correctly, we recommend testing the switching status (see table. 6) in both the released and applied braking states.

3.1.5 Manual release (optional)

To temporarily release the brake when there is no electricity available, a manual release function is available as an option instead of the transport safety bolts otherwise used. The manual release system works on both brake circuits together.



NOTICE

- The manual release is designed for activation via a Bowden cable.
- Releasing an individual brake circuit is only possible electrically.



NOTICE

It is possible to retrofit the manual release system,  28.

3.1.6 Encapsulated design (optional)

This design not only avoids the penetration of spray water and dust, but also the spreading of abrasion particles outside the brake. This is achieved by:

- a cover seal over the armature plate and rotor,
- a cover in the adjuster nut,
- a shaft seal in the adjuster nut for continuous shafts (option).

3.1.7 Noise reduction (optional)

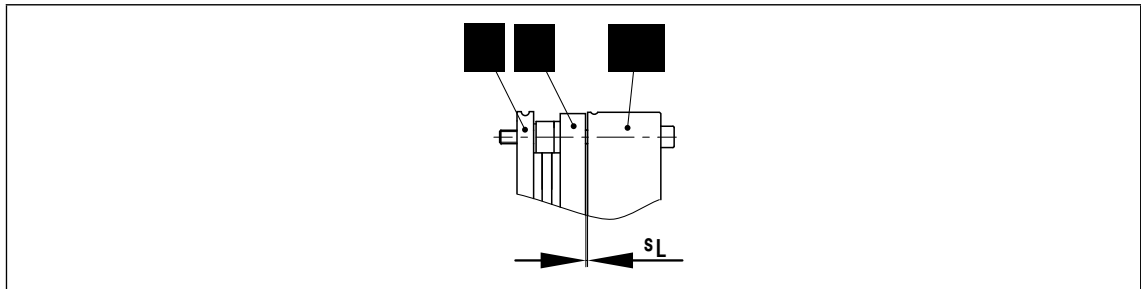
In addition to the standard noise reduction, the armature plates can be fitted with noise reducers. This will reduce the switching noises.

3.1.8 Project planning notes

- The brakes are dimensioned in such a way that the given rated torques are reached safely after a short run-in process.
- However, as the organic friction linings used do not all have identical properties and because environmental conditions can vary, deviations from the specified braking torques are possible. These must be taken into account in the form of appropriate dimensioning tolerances. Increased breakaway torque is common in particular after long downtimes in humid environments where temperatures vary.
- Check the braking torque if the brake is inserted on the customer's friction surfaces.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

3.2 Rated data

3.2.1 Dimensions



1.1 Stator, complete

2 Armature plate

6 Flange

Type	Air gap		Perm. wear [mm]	Rotor thickness		Stator weight complete m [kg]
	$s_{LN}^{+0.05}$ [mm]	s_{Lmax} [mm]		min. [mm]	max. [mm]	
BFK464-17S	0.4	0.6	0.2	12.7	13	12
BFK464-18S	0.4	0.6	0.2	12.7	13	15
BFK464-18S.2	0.4	0.6	0.2	12.7	13	14.5
BFK464-19S	0.4	0.6	0.2	15.7	16	18.8
BFK464-20S	0.4	0.6	0.2	15.7	16	24.5
BFK464-20S.1	0.4	0.6	0.2	15.7	16	24.5
BFK464-25S	0.4	0.6	0.2	19.7	20	42
BFK464-25S.1	0.4	0.6	0.2	19.7	20	42
BFK464-28S	0.5	0.8	0.3	17.6	18	46

Type	Pitch circle		Fixing screws DIN 912		Minimum thread depth +1.0 mm		Tightening torque	
	∅ [mm]	Thread	without Flange [mm]	with Flange [mm]	without Flange [mm]	with Flange [mm]	without flange M _A [Nm]	without flange M _A [Nm]
BFK464-17S	180	M8	6 x M8x85	6 x M8x95	14	13	24.6	24.6
BFK464-18S	196	M8	6 x M8x90	6 x M8x105 ¹⁾	17	19.5	24.6	36.1
BFK464-18S.2	196	M10	6 x M8x90	6 x M8x105	17	19.5	24.6	24.6
BFK464-19S	220	M10	6 x M10x100	6 x M10x110	24	23	48	48
BFK464-20S	230	M10	6 x M10x100	6 x M10x110	19	18	48	48
BFK464-20S.1	230	M10	6 x M10x100	6 x M10x110	19	18	48	48
BFK464-25S	278	M10	6 x M10x110	6 x M10x130 ¹⁾	18	22.5	48	71
BFK464-25S.1	278	M10	6 x M10x110	6 x M10x130 ¹⁾	18	22.5	48	71
BFK464-28S	314	M16	6 x M16x120	6 x M16x130	30	27.5	206	206

Tab. 1: Dimensions of the BFK464-□□S; S.1; S.2

¹⁾ Bolt fastening class 10.9 with washers in accordance with ISO 7089-□-300HV-A2C

3.2.2 Electrical data

Type	Voltage		Power ¹⁾		Coil resistance R _N ±5% [Ω]	Current ²⁾ I _{max} [A]
	Release ±10% U [V] DC	Holding ±10% [V] DC	Release P _{max} [W]	Holding P _N [W]		
BFK464-17S	205	103	2 x 194	2 x 49	2 x 216	2 x 0.95
BFK464-18S	205	103	2 x 220	2 x 55	2 x 191	2 x 1.07
BFK464-18S.2	205	103	2 x 120	2 x 30	2 x 350	2 x 0.59
BFK464-19S	205	103	2 x 235	2 x 59	2 x 179	2 x 1.15
BFK464-20S	205	103	2 x 256	2 x 64	2 x 164	2 x 1.25
BFK464-20S.1	205	103	2 x 256	2 x 64	2 x 164	2 x 1.25
BFK464-25S	205	103	2 x 300	2 x 75	2 x 140	2 x 1.46
BFK464-25S.1	103	72	2 x 150	2 x 73	2 x 71	2 x 1.45
BFK464-28S	205	103	2 x 404	2 x 101	2 x 104	2 x 1.97

Tab. 2: Coil power ratings of the BFK464-□□S; S.1; S.2

¹⁾ Power at 20 °C

²⁾ Current at 20°C during release

3.3 Rating (design data)

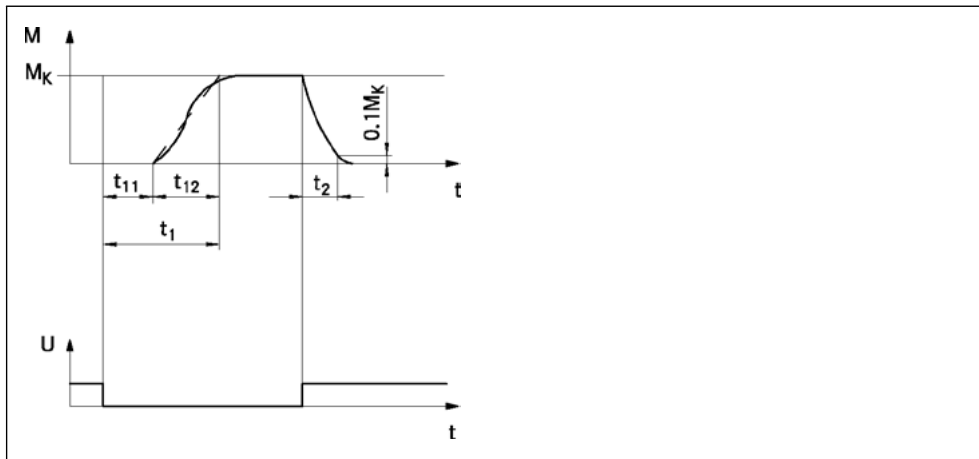


Fig. 2 Operating times of the spring-applied brakes

- t_1 Engagement time
- t_2 Disengagement time (up to $M = 0.1 M_K$)
- M_K Rated torque
- t_{11} Reaction delay of engagement
- t_{12} Rise time of the braking torque
- U Voltage

Type	Rated torque ¹⁾ M_K [Nm]	Max. perm. switching energy Q_E [J]	Transitional switching frequency S_{hue} [1/h]	Operating times [ms] at s_{LN} and $0.7 I_N$ ²⁾				Max. speed ⁴⁾ n_{max} [r/min]
				Engaging DC side ³⁾			Disengaging t_2	
				t_{11}	t_{12}	t_1		
BFK464-17S	2 x 140	42000	25	14	58	72	150	700
BFK464-18S	2 x 225	60000	20	10	58	68	170	455
BFK464-18S.2	2 x 165	60000	20	15	45	60	180	455
BFK464-19S	2 x 280	68000	19	12	50	62	190	455
BFK464-20S	2 x 325	80000	19	14	70	84	190	455
BFK464-20S.1	2 x 275	80000	19	22	60	82	180	455
BFK464-25S	2 x 600	120000	15	15	90	105	280	455
BFK464-25S.1	2 x 500	120000	15	37	95	132	230	455
BFK464-28S	2 x 900	180000	14	14	98	112	300	455

Tab. 3: Switching energy - operating frequency - operating times

- 1) Minimum brake torque with run-in friction components at $\Delta n=100$ r/min
- 2) Typical values
- 3) Measured with induced voltage limitation of -800 V DC
- 4) Max. speed according to EC-type examination certificate (for higher speeds, contact with the manufacturer is required)

Disengagement time


The disengagement time is not influenced by DC or AC switching operations.

Engagement time

The transition from brake-torque free state to holding braking torque is not free of time lags.

For emergency braking, short engagement times for the brake are absolutely essential. The DC switching in connection with a suitable spark suppressor is therefore to be provided.

- The engagement times apply for **DC switching** with a spark suppressor.
 - Spark suppressors are available for the rated voltages.

If the drive system is operated with a frequency inverter so that the brake will not be deenergised before the motor is at standstill, AC switching is also possible (not applicable to emergency braking). In this case, the engagement times increase approximately by a factor of 5, connection  31.

3.4 Switching energy / operating frequency

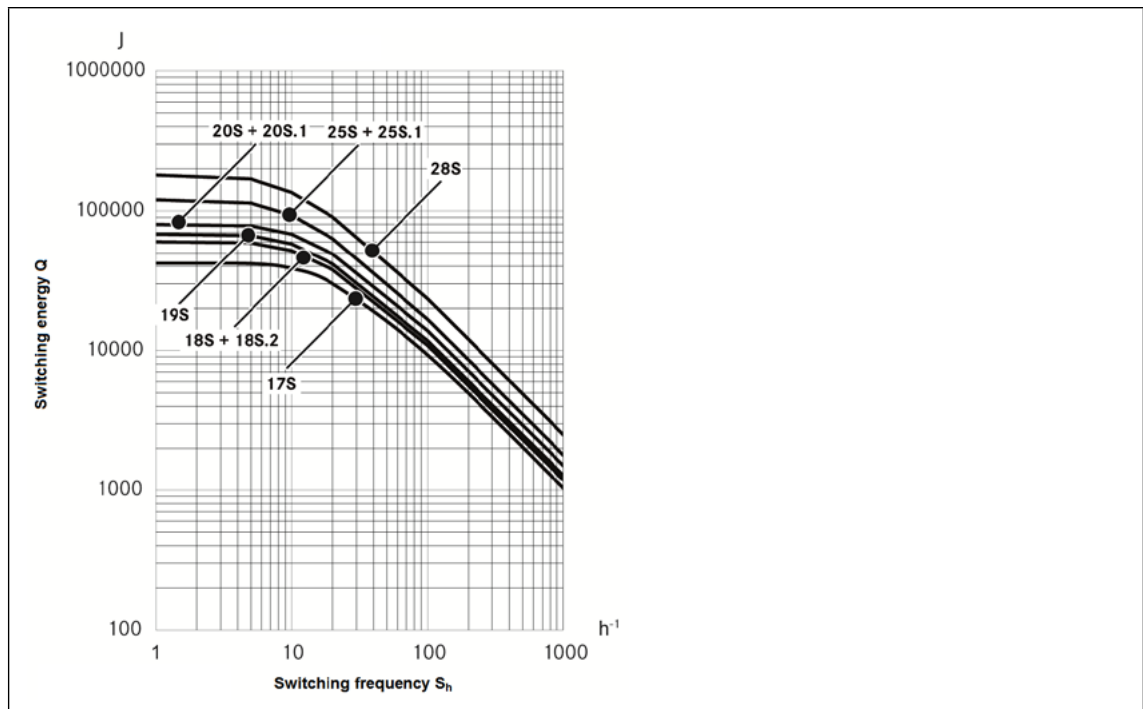


Fig. 3 Switching energy as a function of the operating frequency

$$S_{hmax} = \frac{-S_{hue}}{\ln\left(1 - \frac{Q_R}{Q_E}\right)}$$

$$Q_{smax} = Q_E \left(1 - e^{-\frac{S_{hue}}{S_n}}\right)$$

The permissible operating frequency S_{hmax} depends on the amount of heat Q_R (refer to Figure 3). At a pre-set operating frequency S_n , the permissible amount of heat is Q_{smax} .

With high speeds of rotation and switching energy, the wear increases strongly, because very high temperatures occur at the friction surfaces for a short time.

3.5 Emissions

Electromagnetic compatibility



NOTICE

The user must ensure compliance with EMC Directive 2004/108/EC using appropriate controls and switching devices.

If an INTORQ rectifier is used for the DC switching of the spring-applied brake and if the operating frequency exceeds five switching operations per minute, the use of a mains filter is required.

If the spring-applied brake uses a rectifier of another manufacturer for the switching, it may become necessary to connect a spark suppressor in parallel with the AC voltage. Spark suppressors are available on request, depending on the coil voltage.

Heat

Since the brake converts kinetic energy as well as mechanical and electrical energy into heat, the surface temperature varies considerably, depending on the operating conditions and possible heat dissipation. Under unfavourable conditions, the surface temperature can reach 130 °C.

Noise

The switching noise during engagement and disengagement varies depending on the air path, braking torque and brake size.


Depending on the natural oscillation after installation, operating conditions and the state of the friction surfaces, the brake may squeak during braking.

Others

The abrasion of the friction parts produces dust.




4 Mechanical installation

4.1 Important notes

	NOTICE
	The toothed hub and screws must not be lubricated with grease or oil.

4.2 Necessary tools

Type	Torque wrench Insert for hexagonal socket (Allen) screws		Open-jawed spanner		Allen key for transport safety bolts
	Measuring range [Nm]	Width across flats [mm]	Sleeve bolts Width across flats [mm]	Manual release - nuts Width across flats [mm]	Width across flats [mm]
BFK464-17S	20 - 100	6	15	10	5
BFK464-18S		6	15	10	5
BFK464-18S.2		6	15	10	5
BFK464-19S		8	17	13	6
BFK464-20S		8	17	13	6
BFK464-20S.1		8	17	13	6
BFK464-25S		8	17	13	6
BFK464-25S.1		8	17	13	6
BFK464-28S	40 - 250	14	24	17	8

Multimeter	Caliper gauge	Feeler gauge
		

4.3 Assembly

4.3.1 Important notes

Brake size	Minimum requirements: Use as counter friction surface				
	Material ¹⁾	Evenness [mm]	Axial runout [mm]	Roughness	Others
17 – 28	S235 JR C15 EN-GJL-250	< 0.1	0.1	Rz10 ... Rz16	<ul style="list-style-type: none"> ■ Threaded holes with minimum thread depth 16 ■ Free of grease and oil

Tab. 4: Counter friction face design of the end shield

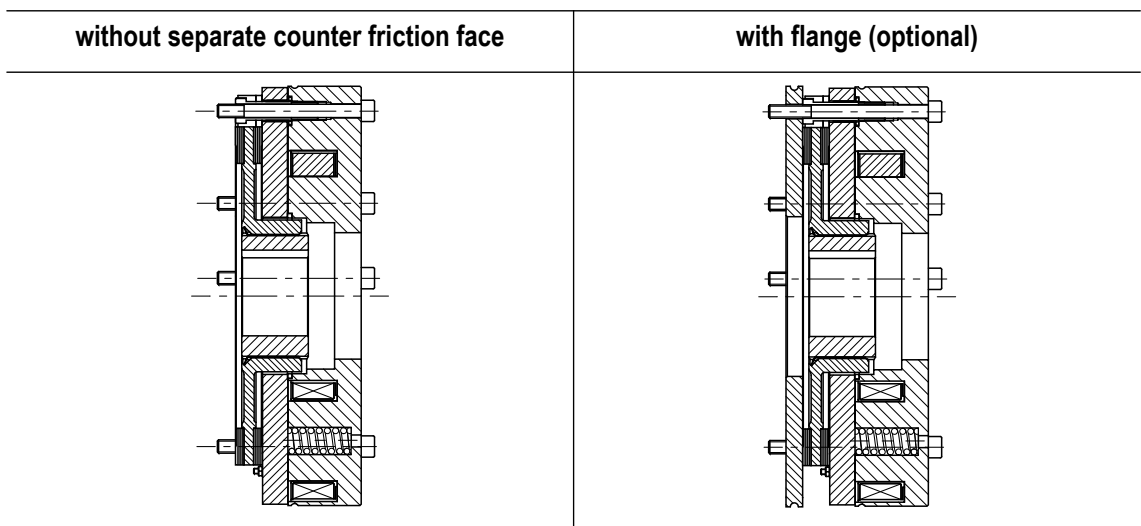
¹⁾ In case of other materials, please consult INTORQ.

The diameter of the shaft shoulder must not be greater than the tooth root diameter of the hub.


4.3.2 Preparation



1. Unpack the spring-applied brake.
2. Check for completeness.
3. Check the name plate data (especially the rated voltage).

4.3.3 Overview




4.4 Installation procedure

	NOTICE
	The toothed hub and screws must not be lubricated with grease or oil.

	NOTICE
	When you have ordered a version with flange, attach the hub first ( 22), then continue with the "Assembly of the counter friction faces".

4.4.1 Install the hub onto the shaft

	NOTICE
	For reverse operations, we recommend also glueing the hub to the shaft.

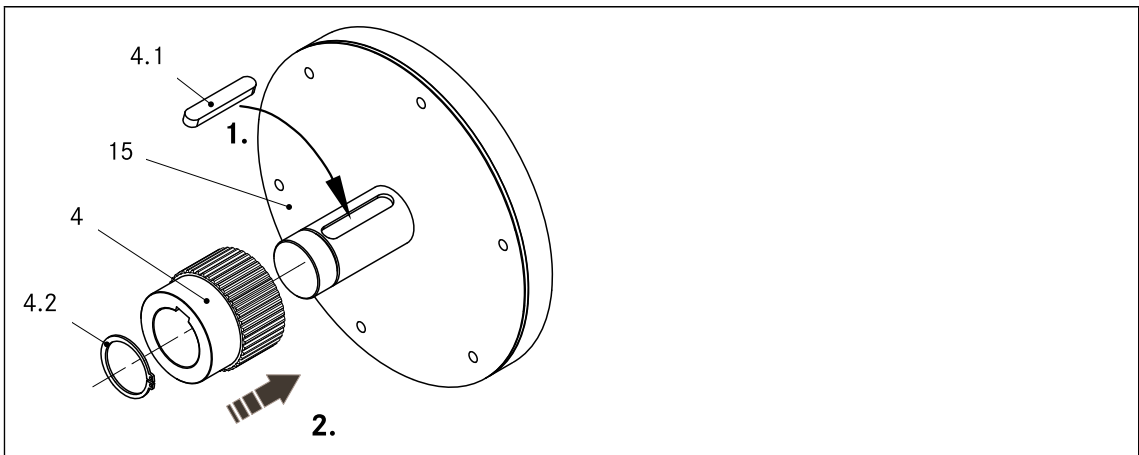


Fig. 4 Installing the hub onto the shaft

- | | |
|---------|---------------------|
| 4 Hub | 4.2 Securing device |
| 4.1 Key | 15 End shield |

1. Insert the key (4.1) into the shaft.
2. Press the hub (4) onto the shaft.
3. Secure the hub against axial displacement (for example, by using a circlip (4.2)).

4.4.2 Brake assembly

Assembly without counter friction face

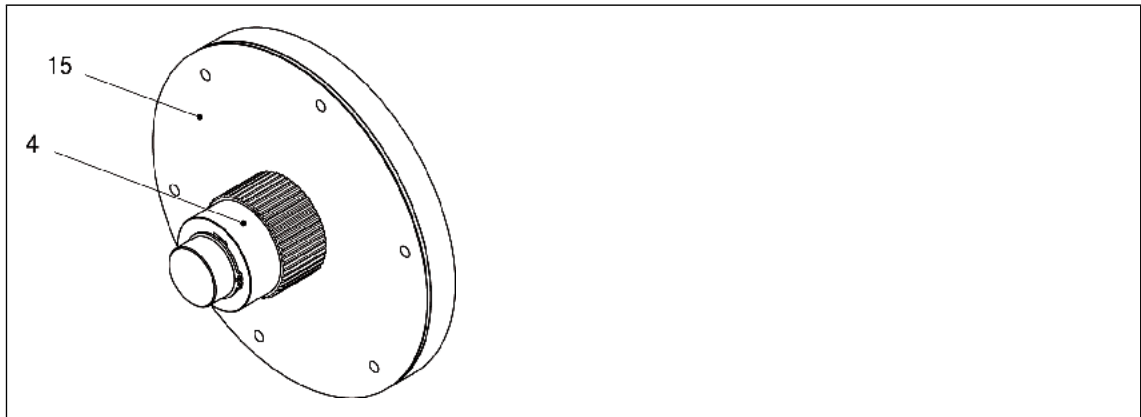


Fig. 5 Assembly without counter friction face

4 Hub

15 End shield

Install the counter friction faces

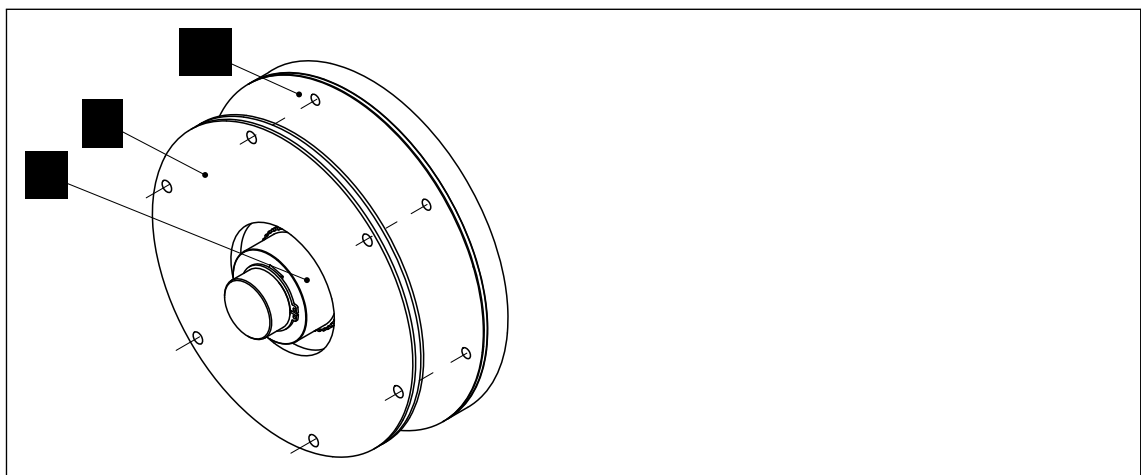


Fig. 6 Assembly of the flange

4 Hub

6 Flange

15 End shield

1. Hold the flange (6) to the end shield (15).
2. Align the through holes in the flange and the threads of the fastening bore holes.

Assembly of the rotor

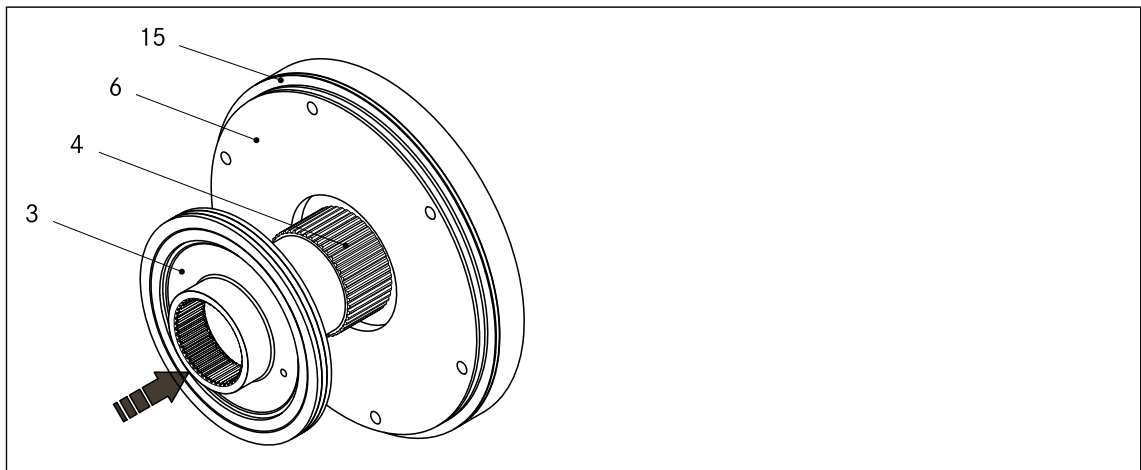


Fig. 7 Mounting the hub onto the shaft

- | | |
|------------------|---------------|
| 3 Complete rotor | 6 Flange |
| 4 Hub | 15 End shield |

1. Push the complete rotor (3) onto the hub (4) and check whether it can be moved by hand. Do not use any lubricant! (Exception: Rotor with sprayed tothing by the manufacturer.)

In the following sections, only assembly for the versions with flange will be described.

Assembly of the complete stator

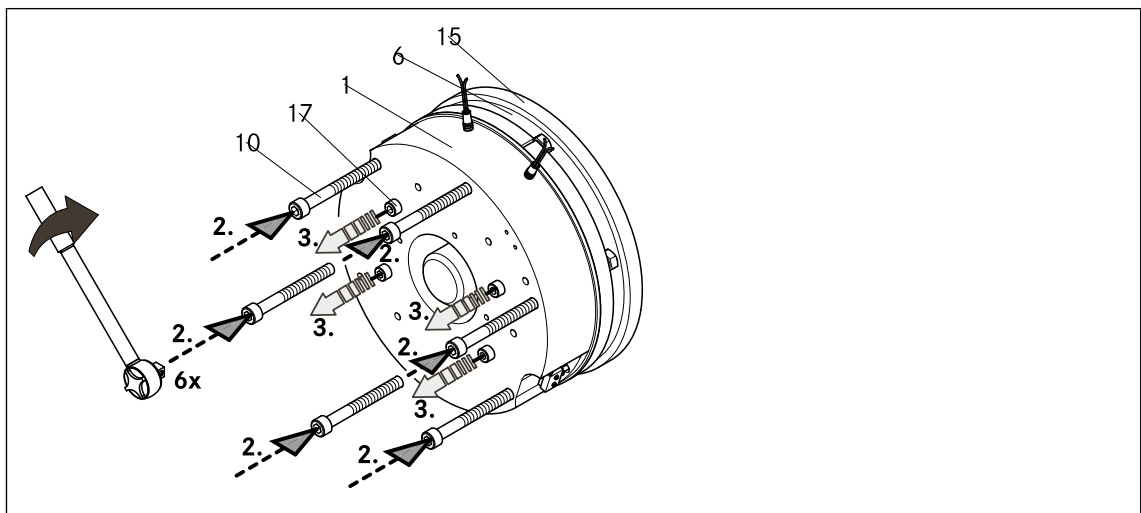


Fig. 8 Mounting the complete stator

- | | |
|-----------------------|--------------------------|
| 1 Stator, complete | 15 End shield |
| 6 Flange | 17 Transport safety bolt |
| 10 Cylinder head bolt | |

1. Push the complete stator (1) onto the shaft.
2. Screw the complete stator (1) into the bearing shield (15) using the bolts (10)
3. Remove the transport safety bolts (17) (discard).

4.4.3 Check the air gap

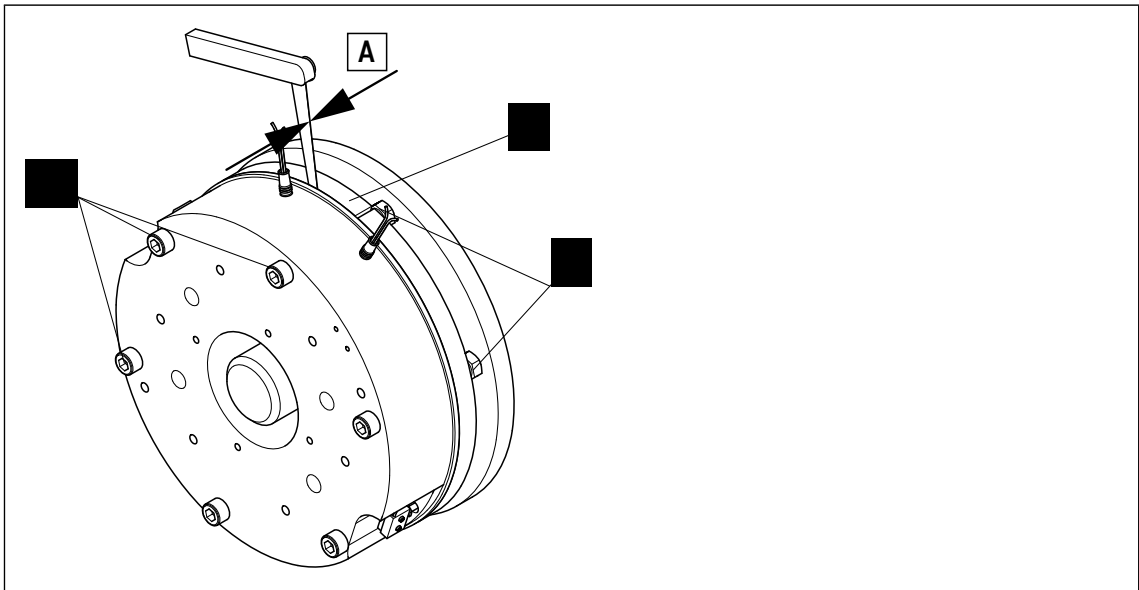


Fig. 9 Checking "s_L"

A Air gap, s_L

- | | | |
|------------------|---------------|-----------------------|
| 1.1 Stator | 6 Flange | 10 Cylinder head bolt |
| 2 Armature plate | 9 Sleeve bolt | 15 End shield |

1. Check the air gap "s_L" near the bolts (10) using a feeler gauge and compare the values to the values for "s_{LN}" in the table (15).





NOTICE

Do not insert feeler gauge more than 10 mm between armature plate (2) and stator (1.1)!

If "s_L" (15) is not within the tolerance, readjust the air gap.

4.4.4 Adjusting the air gap

	 WARNING
	<p>Danger: rotating parts! Switch off the voltage. The drive system must be free of loads.</p>

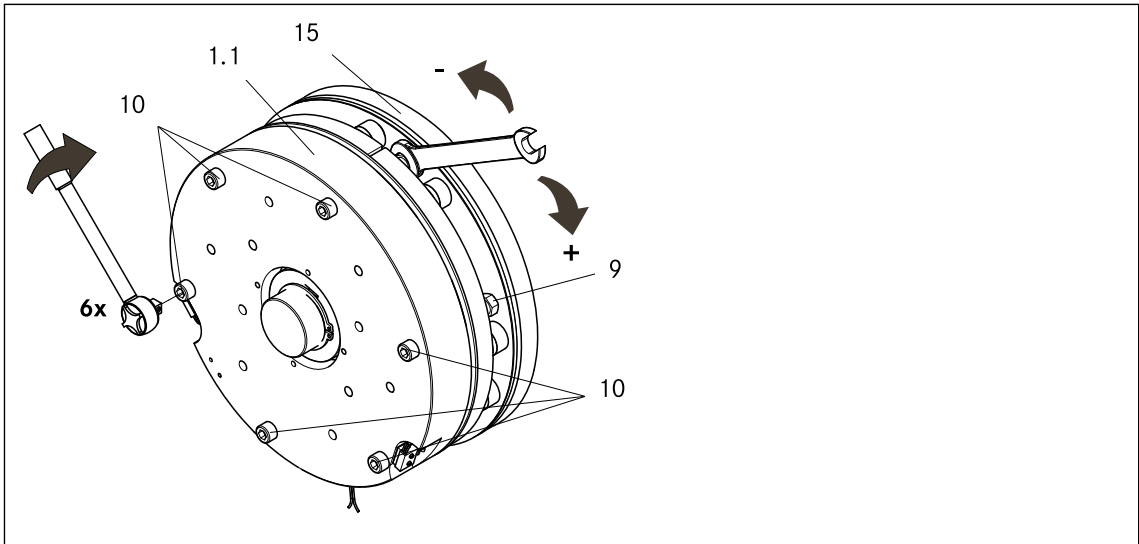




Fig. 10




1. Loosen the bolts (10).





NOTICE


First correctly adjust the air gap with every 2nd bolt (10) / sleeve bolt (9)! The other three sleeve bolts should be screwed into the stator so that they do not touch the flange or the bearing shield. Then repeat the process with the other three bolts (10).

2. Slightly turn the sleeve bolts (9) using an open end spanner.
 - If the air gap is too large, screw into the stator (1.1).
 - If the air gap is too small, screw them out of the stator (1.1).
 - 1/6 turn will change the air gap by approximately 0.15 mm.
3. Tighten the bolts (10), (for torques, see table  16).
4. Check the air gap "s_L" near the bolts (10) with a feeler gauge, ("s_{LN}"  15).
5. Repeat the adjustment procedure if the deviation of "s_{LN}" is too large.

	<p>NOTICE</p>
	<p>Only for brakes with manual release  Additionally check the dimension "s" and adjust if necessary  29.</p>

	 DANGER
	<p>Brake may fail If the manual release is not adjusted correctly the brake may fail.</p> <p>Possible consequences:</p> <ul style="list-style-type: none"> ■ Severe injuries or material damage. <p>Protective measure:</p> <ul style="list-style-type: none"> ■ Ensure that the dimension "s" is observed.

4.4.5 Cover ring assembly

 **NOTICE**
Brakes without flange require a groove in the bearing shield for the lip of the cover ring.

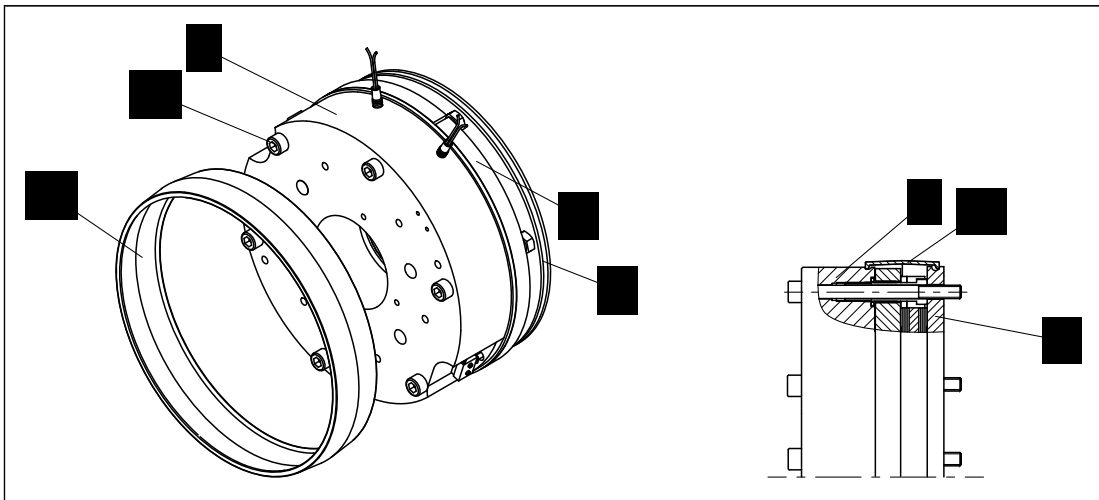



Fig. 11 Cover ring assembly

- | | | |
|--------------------|-----------------------|---------------|
| 1 Stator, complete | 6 Flange | 13 Cover ring |
| 2 Armature plate | 10 Cylinder head bolt | |

1. Pull the cable through the cover ring (13).
2. Push the cover ring (13) over the complete stator (1).
3. Press the lips of the cover ring (13) into the groove of the complete stator (1) and flange (6) or the bearing shield.

 **NOTICE**
Cover ring with condensation drain hole:
Fit the cover ring so that condensation can drain through the hole.

4.4.6 Manual release assembly (optional)



NOTICE

The assembly of the manual release is done to the spring-applied brake which is already fitted to the bearing shield 23. The air gap of the brake is set to the rated air gap, 15.

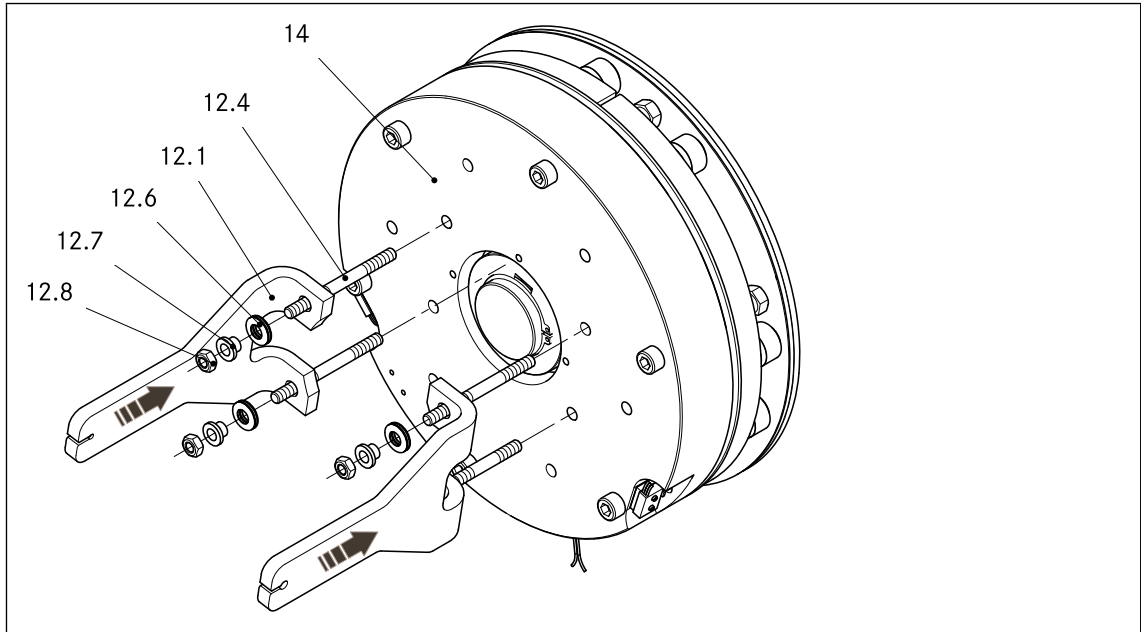
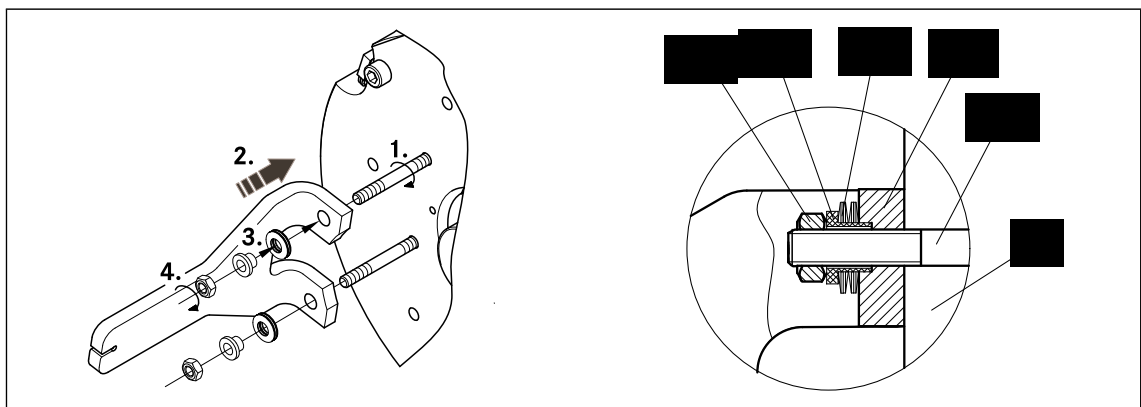


Fig. 12 Assembly of the manual release

- | | | |
|-----------------|------------------|-----------|
| 12.1 Lever | 12.6 Cup springs | 12.8 Nuts |
| 12.4 Stud bolts | 12.7 Sleeves | 14 Brake |



1. Insert four stud bolts (12.4) into the bore holes of the transport safety bolts which have been removed and screw down tight using a screw driver.
2. Locate the levers (12.1) onto the brake (14).
3. Place four cup springs (12.6) in alternate directions in each of the four sleeves (12.7). Finally, insert the sleeves into the holes in the lever (12.1).

4. Screw self-locking nuts (12.8) onto the stud bolts and tighten them until the dimension "s" has been set.



NOTICE

Before setting the dimension "s", it is imperative that the air gap "s_L" is checked, and adjusted to "s_{LN}" (15), if required. The brake is **not** energised during adjustment.



Fig. 13 Dimension "s_L" and "s"

- 1.1 Stator, complete 6 Flange 12.1 Lever
- 2 Armature plate






Type	s _{LN} ^{+0.05} [mm]	s ^{+0.1} [mm]
BFK464-17S	0.4	5.3
BFK464-18S		
BFK464-18S.2		
BFK464-19S		
BFK464-20S		
BFK464-20S.1		
BFK464-25S		
BFK464-25S.1	0.5	6.5
BFK464-28S		

	DANGER
	<p>Brake may fail If the manual release is not adjusted correctly the brake may fail.</p> <p>Possible consequences:</p> <ul style="list-style-type: none"> ■ Severe injuries or material damage. <p>Protective measure:</p> <ul style="list-style-type: none"> ■ Ensure that the dimension "s" is observed.

5 Electrical installation

5.1 Electrical connection

5.1.1 Important notes

	<p>! DANGER</p> <p>There is a risk of injury by electrical shock!</p> <ul style="list-style-type: none"> ■ Electrical connection must only be carried out by skilled personnel! ■ Only carry out connection work when no voltage is applied (no live parts)! There is a risk of unintended start-ups or electric shock.
	<p>NOTICE</p> <ul style="list-style-type: none"> ■ It must be ensured that the supply voltage corresponds to the name plate data.
	<p>NOTICE</p> <ul style="list-style-type: none"> ■ If an emergency stop is carried out without the required suppressor circuit, the control unit may be destroyed. ■ Observe the correct polarity of the suppressor circuit!
	<p>NOTICE</p> <ul style="list-style-type: none"> ■ To functionally test the individual brake circuits, the power supply must be able to be switched off individually. For a new over energisation when switching on, it is also necessary to open switches K1/K3. ■ The protective circuitry contained in the INTORQ switching device BEG-561-□□□-□□□ (terminals 3 and 4) is not permitted for use in the lift system. The protective circuitry must be connected parallel to the brake coil here,  31.

5.1.2 Switching suggestions

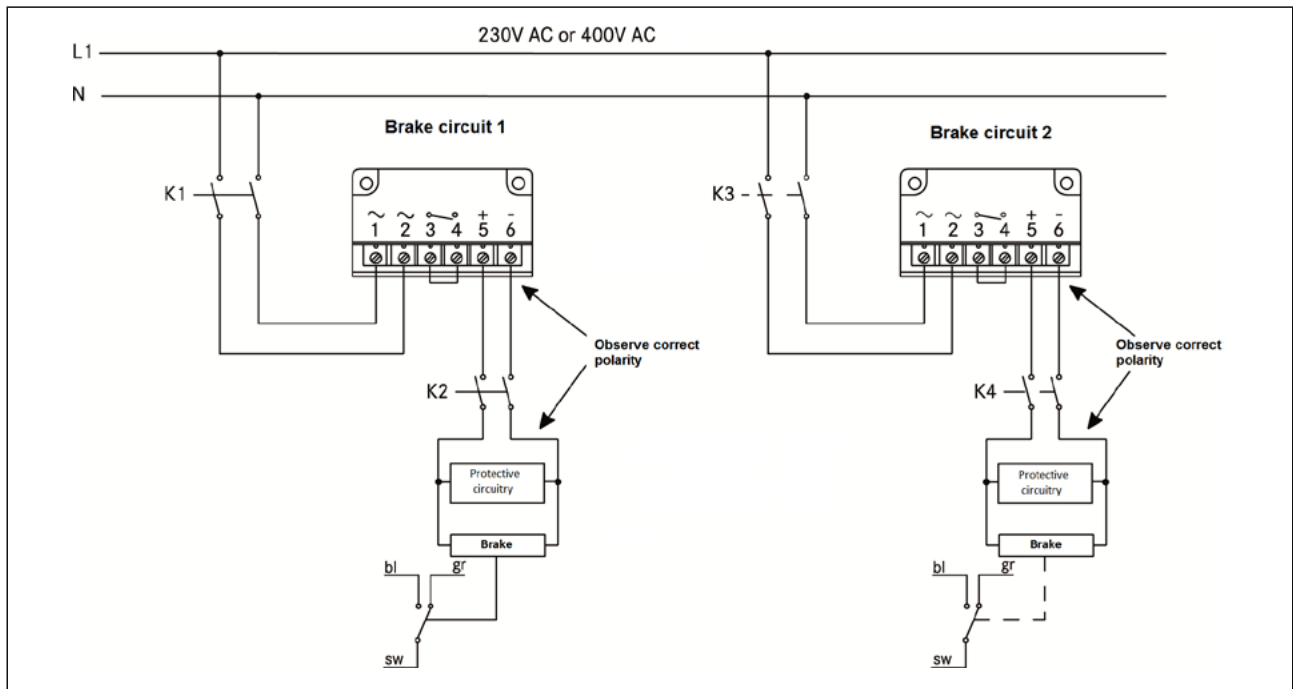


Fig. 14 INTORQ BFK464 connection diagram

Switching on

- K2/K4 must be switched on before or at the same time as K1/K3!

Switching off

- Normal - AC switching
 - K2/K4 remain closed
 - K1/K3 open
- Emergency stop - DC switching
 - K1/K3 and K2/K4 are opened at the same time

5.2 Bridge/half-wave rectifiers (optional)

BEG-561-□□□-□□□

The bridge/half-wave rectifiers are used to supply electromagnetic DC spring-applied brakes which are approved for the use with such rectifiers. Other use is only permitted with the approval of INTORQ.

Once a set overexcitation time has elapsed, the bridge/half-wave rectifiers switch over from bridge rectification to half-wave rectification. Depending on the design of the load, an improvement of the switching behaviour or a reduction in performance is possible.

5.2.1 Assignment: Bridge/half-wave rectifier - brake size

Rectifier type	Supply voltage [V AC]	Coil voltage Release / holding [V DC]	Assigned brake
BEG-561-255-030	230 $\pm 10\%$	205 / 103	BFK464-17S
BEG-561-255-030			BFK464-18S
BEG-561-255-030			BFK464-18S.2
BEG-561-255-030			BFK464-19S
BEG-561-255-030			BFK464-20S
BEG-561-255-030			BFK464-20S.1
BEG-561-255-130			BFK464-25S
BEG-561-255-130			BFK464-25S.1
BEG-561-255-130			BFK464-28S
BEG-561-440-030-1	400 $\pm 10\%$	360 / 180	BFK464-17S
BEG-561-440-030-1			BFK464-18S
BEG-561-440-030-1			BFK464-18S.2
BEG-561-440-030-1			BFK464-19S
BEG-561-440-030-1			BFK464-20S
BEG-561-440-030-1			BFK464-20S.1
BEG-561-440-130			BFK464-25S
BEG-561-440-130			BFK464-25S.1
BEG-561-440-130			BFK464-28S

**NOTICE**

The BFK464-25S.1 brake version in the voltage version 103 / 72 V, is operated by means of a switching device **provided by the customer** which reduces the coil voltage from 103 V DC to 72 V DC.

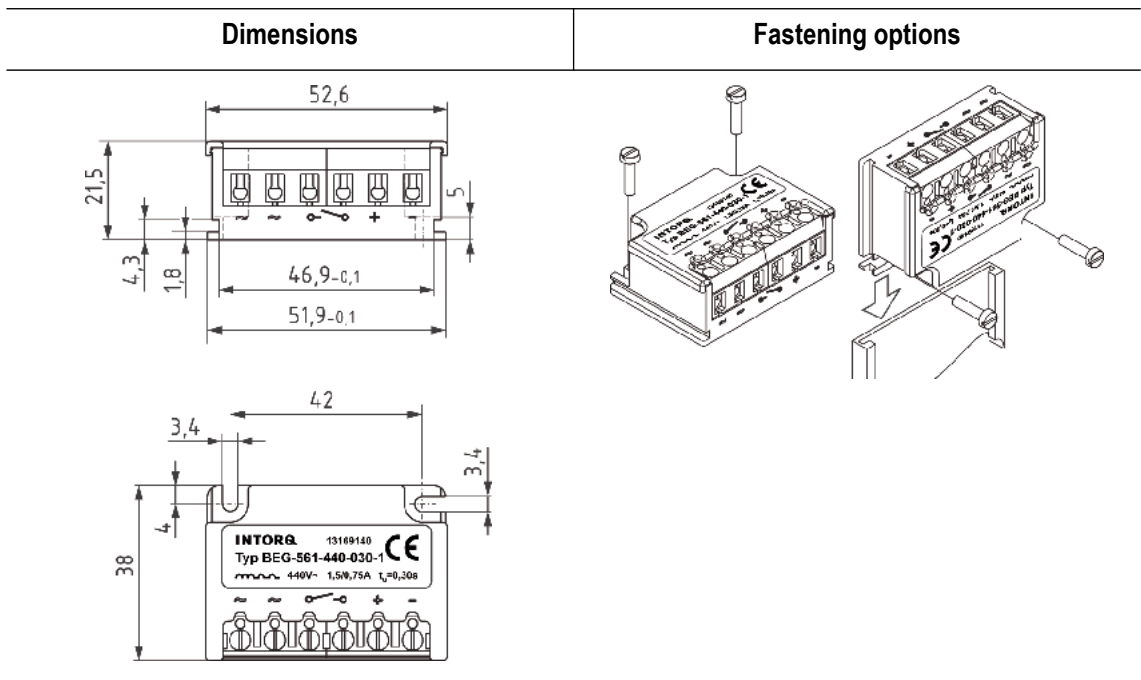


Fig. 15 Dimensions and possible installations of bridge/half-wave rectifier

5.2.2 Technical specifications

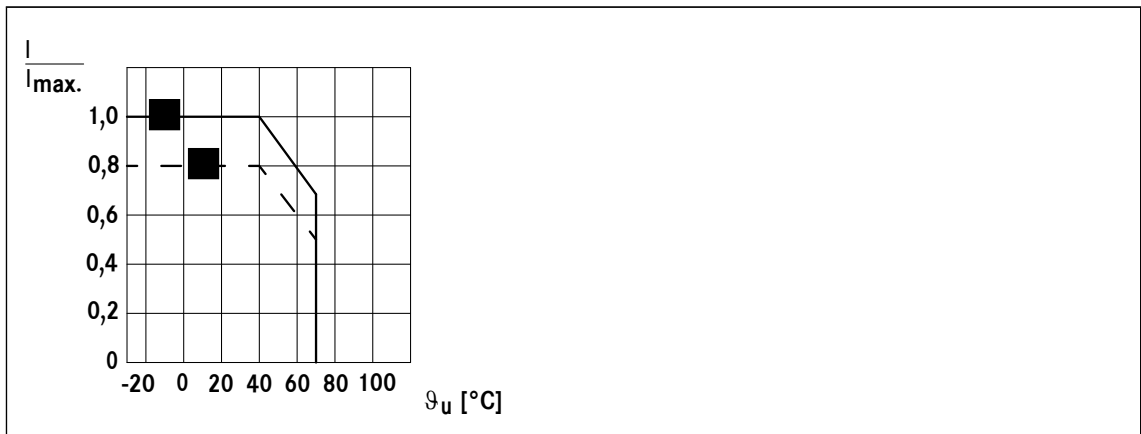
Rectifier type	Bridge/half-wave rectifier
Output voltage for bridge rectification	$0.9 \times U_1$
Output voltage for half-wave rectification	$0.45 \times U_1$
Ambient temperature (storage/operation) [°C]	-25 – +70

Type	Input voltage U_1 (40 Hz ... 60 Hz)			Max. current I_{max}		Overexcitation time $t_{\ddot{u}}$ ($\pm 20\%$)		
	min. [V ~]	Rated [V ~]	max. [V ~]	Bridge [A]	half-wave [A]	at U_{1min} [s]	at U_{1Nenn} [s]	at U_{1max} [s]
BEG-561-255-030	160	230	255	3.0	1.5	0,430	0,300	0,270
BEG-561-255-130						1,870	1,300	1,170
BEG-561-440-030-1	230	400	440	1.5	0.75	0,500	0,300	0,270

Tab. 5: Data for bridge/half-wave rectifier type BEG-561


U_1 input voltage (40 ... 60 Hz)


5.2.3 Permissible current load at ambient temperature



- 1 For screw assembly with metal surface (good heat dissipation)
- 2 For other assembly (e.g. adhesive)



5.3 Electrical connection

	<p>! DANGER</p> <p>There is a risk of injury by electrical shock! The brake must only be electrically connected when no voltage is applied!</p>
---	---

	<p>NOTICE</p> <p>Compare the coil voltage of the stator to the DC voltage of the installed rectifier.</p>
---	--

6 Commissioning and operation

6.1 Important notes



	 DANGER
	<ul style="list-style-type: none"> ■ The live connections and the rotating rotor must not be touched. ■ The drive must not be running when checking the brake.



- The brakes are dimensioned in such a way that the given rated torques are reached safely after a short run-in process.
- However, as the organic friction linings used do not all have identical properties and because environmental conditions can vary, deviations from the specified braking torques are possible. These must be taken into account in the form of appropriate dimensioning tolerances. Increased breakaway torque is common in particular after long downtimes in humid environments where temperatures vary.
- Check the braking torque if the brake is inserted on the customer's friction surfaces.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

6.2 Function checks before commissioning


6.2.1 Functional checks


Brake with microswitch

	 DANGER
	<p>Danger: rotating parts! The brake must be free of residual torque. The motor must not run!</p>

	 DANGER
	<p>There is a risk of injury by electrical shock! Live connections must not be touched.</p>

1. The switching contact for the brake must be open.
2. Remove two bridges from the motor terminals to deenergise the motor.
 - Do **not** disconnect the supply voltage for the brake. Apply DC voltage to the brake.

	NOTICE
	If the brake is connected to the neutral point of the motor, the PE conductor must also be connected to this point.

3. Apply DC voltage to the brake.
4. Measure the AC voltage at the motor terminals. The measured level must be zero.
5. Close the switching contact for the brake.
 - The brake is released.
6. Measure the DC voltage at the brake:
 - The measured DC voltage after the overexcitation time (see bridge/half-wave rectifier,  32) must correspond to the holding voltage (see table 5). A deviation of $\pm 10\%$ is permissible.
7. Check the air gap "s_L".
 - It must be zero and the rotor must rotate freely.
8. Check the switching status of the microswitch (see table 6).
9. Open the switching contact for the brake.
 - The brake is applied.
10. Check the switching status of the microswitch (see table 6).
11. Switch off DC voltage for the brake.
12. Screw the bridges onto the motor terminals.
13. If necessary, remove the neutral conductor from the neutral point (step 2).

Contact type	Connection	Brake released	Microswitch closed
NC contact	black / grey	yes	no
		no	yes
NO contact	black / blue	yes	yes
		no	no

Tab. 6: Switching status of the microswitch

6.2.2 Test that the manual release functions

**NOTICE**

- The manual release is designed for activation via a Bowden cable.
- Releasing an individual brake circuit is only possible electrically.

	DANGER
	Danger: rotating parts! The drive system must be free of loads. The motor must not run!

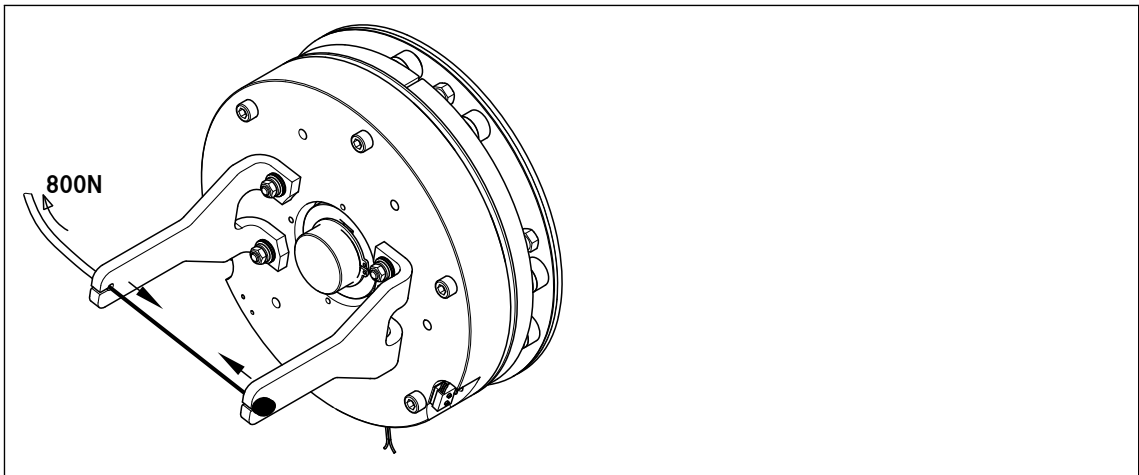


Fig. 16 Turning direction of the lever

Motor and brake are deenergised.



14. Suspend Bowden cable (not included in the delivery package) and pul with approx. 800 N.
 - The drive must be able to be turned freely. A low residual torque is permitted.
15. Release the lever.
 - Torque must be available!



The preparations for commissioning are completed.


6.3 Commissioning

1. Switch on drive system.
2. Carry out a braking test.

6.4 During operation


	 DANGER
	Danger: rotating parts! The running rotor must not be touched.


	 DANGER
	There is a risk of injury by electrical shock! Live connections must not be touched.

- Checks must be carried out regularly. Pay special attention to:
 - unusual noises or temperatures
 - loose fixing elements
 - the condition of the electrical cables
- The armature plate must be attracted and the rotor must move without residual torque.
- Measure the DC voltage at the brake.
 - The measured DC voltage after the overexcitation time (see bridge/half-wave rectifier,  32) must correspond to the holding voltage (see table 5). A deviation of $\pm 10\%$ is permissible.
- If faults occur once, go through the troubleshooting table in chapter 8. If the fault cannot be fixed or eliminated, please contact your customer service.

7 Maintenance and repair

7.1 Wear of spring-applied brakes

INTORQ spring-applied brakes are wear-resistant and designed for long maintenance intervals. The friction lining and braking mechanism are subject to operational wear. For safe and trouble-free operation, the brake must be checked at regular intervals or replaced, if necessary  40.

	NOTICE
	<p>Braking torque reduction</p> <p>The air gap must not be re-adjusted after it has been correctly adjusted during the initial installation of the brake on the motor! This could result in a loss of braking torque.</p>

The table below shows the different causes of wear and their impact on the components of the spring-applied brake. The influential factors must be quantified so that the service life of the rotor and brake can be calculated and so that the prescribed maintenance intervals can be specified accurately. The most important factors in this context are the applied friction energy, the initial speed of rotation of braking and the operating frequency. If several of the causes of friction lining wear occur in an application at the same time, the influencing factors should be added together when the amount of wear is calculated. The calculation of the service interval can be supported by the design program INTORQ-Select.

Component	Cause	Effect	Influencing factors
Friction lining	Braking during operation	Wear of the friction lining	Friction work
	Emergency stops		
	Overlapping wear during start and stop of drive		
	Active braking via the drive motor with support of brake (quick stop)		
	Starting wear in case of motor mounting position with vertical shaft, even when the brake is not applied		Number of start/stop cycles
Armature plate and counter friction face	Rubbing of brake lining	Run-in of armature plate and counter friction face	Friction work
Gear teeth of brake rotor	Relative movements and shocks between brake rotor and brake shaft	Wear of gear teeth (primarily on the rotor side)	Number of start/stop cycles
Brake support	Load reversals and jerks in the backlash between armature plate, adjustment tubes and guide pins	Breaking of armature plate, adjustment tubes and guide pins	Number of start/stop cycles, braking torque
Springs	Axial load cycle and shear stress of springs through radial backlash on reversal of armature plate	Reduced spring force or fatigue failure	Number of switching operations of brake

Tab. 7: Causes for wear





7.2 Inspections

To ensure safe and trouble-free operations, the spring-applied brakes must be checked at regular intervals and, if necessary, be replaced. Servicing will be easier at the plant if the brakes are made accessible. This must be considered when installing the drives in the plant.

Primarily, the required maintenance intervals for industrial brakes result from their load during operation. When calculating the maintenance interval, all causes for wear must be taken into account, [39]. For brakes with low loads (such as holding brakes with emergency stop function), we recommend a regular inspection at a fixed time interval. To reduce costs, the inspection can be carried out along with other regular maintenance work in the plant.

Failures, production losses or damage to the system may occur when the brakes are not serviced. Therefore, a maintenance strategy that is adapted to the particular operating conditions and brake loads must be defined for every application. For the spring-applied brakes, the maintenance intervals and maintenance operations listed in the table below must be followed. The maintenance operations must be carried out as described in the detailed descriptions.

7.2.1 Maintenance intervals

Type	Time interval	
	for service brakes:	for holding brakes with emergency stop:
BFK464□□-S/S.1/S.2	<ul style="list-style-type: none"> ■ according to service life calculation ■ or else every six months ■ after 4000 operating hours at the latest 	<ul style="list-style-type: none"> ■ at least every two years ■ after 1 m cycles at the latest
Maintenance		
	Inspections with assembled brake: <ul style="list-style-type: none"> ■ Check release function and control  42 ■ Measure the air gap (adjust if required)  25 ■ Measure the rotor thickness (replace rotor if required)  42 ■ Thermal damage of the armature plates or flange (dark-blue tarnishing) 	Inspections after the brake has been removed: <ul style="list-style-type: none"> ■ Check the play of the rotor toothing (replace worn-out rotors)  42 ■ Breaking out of the torque support at the sleeve bolts and the armature plate ■ Check the springs for damage ■ Check the armature plate and flange or bearing shield <ul style="list-style-type: none"> - Levelness < 0.1 mm - Max. run-in depth = rated air gap of the size

7.3 Maintenance



NOTICE

Brakes with defective armature plates, socket head cap screws, springs or counter friction faces must always be replaced completely.

Generally observe the following for inspections and maintenance works:

- Contamination by oils and greases should be removed using brake cleaner, or the brake should be replaced after determining the cause. Dirt and particles in the air gap between the stator and the armature plate endanger the function and should be removed.
- After replacing the rotor, the original braking torque will not be reached until the run-in operation for the friction surfaces has been completed. After replacing the rotor, the run-in armature plates and counter friction faces have an increased initial rate of wear.

7.3.1 Check the rotor thickness

	DANGER
	<p>Danger: rotating parts! The motor must not run during the check.</p>

1. Stop motor and control system!
2. Remove the motor cover and remove the cover ring, if present.
3. Measure the rotor thickness using a caliper gage.
4. Compare the measured rotor thickness against the minimal permitted rotor thickness (15).
5. If required, replace the rotor completely. Description, see 42.



7.3.2 Check the air gap



	DANGER
	<p>Danger: rotating parts! The motor must not run during the check.</p>



1. Stop motor and control system!
2. Measure the air gap " s_l " near the fixing screws between the armature plate and the stator using a feeler gauge.
3. Compare the measured air gap with the maximum permitted air gap " s_{Lmax} " (15).
4. If required, replace the rotor completely. Description, see 42.

7.3.3 Release / voltage



1. Start motor and control system!

	 DANGER
	Danger: rotating parts! The running rotor must not be touched.

	 DANGER
	There is a risk of injury by electrical shock! Live connections must not be touched.



2. Observe the air gap "s_L" when the drive is running. It should be zero.
3. Measure the DC voltage at the brake.
 - After the overexcitation time (see bridge/half-wave rectifier,  32), the measured DC voltage must correspond to the holding voltage ( 33). A deviation of ±10 % is permissible.

7.3.4 Replacing the rotor

	 DANGER
	Danger: rotating parts! The brake must be free of residual torque.

1. Switch off voltage!
2. Disconnect the connection cable.
3. Loosen the screws evenly and remove them completely.
4. Remove the complete stator from the bearing shield. Pay attention to the connection cable.
5. Pull the complete rotor from the hub.
6. Check the tothing of the hub.
7. Replace the hub too if it is worn.
8. Check the friction surface on the bearing shield. In case of strong scoring at the flange, replace the flange. In case of strong scoring on the bearing shield, rework the friction surface.
9. Measure the rotor thickness (new rotor) and head height of the sleeve bolts with a calliper gauge.
10. Calculate the distance between the stator and the armature plate as follows:

Distance = rotor thickness + s_{LN} - head height

("s_{LN}"  15)
11. Unscrew the sleeve bolts evenly until the calculated distance between stator and armature plate is reached.
12. Install and adjust the new complete rotor and stator,  24.
13. Reconnect the connection cable.

7.4 Spare-parts list

- Only parts with item numbers are available.
 - The item numbers are only valid for the standard design.
- Please include the following information with the order:
 - Order number of the brake
 - Position number of the spare part

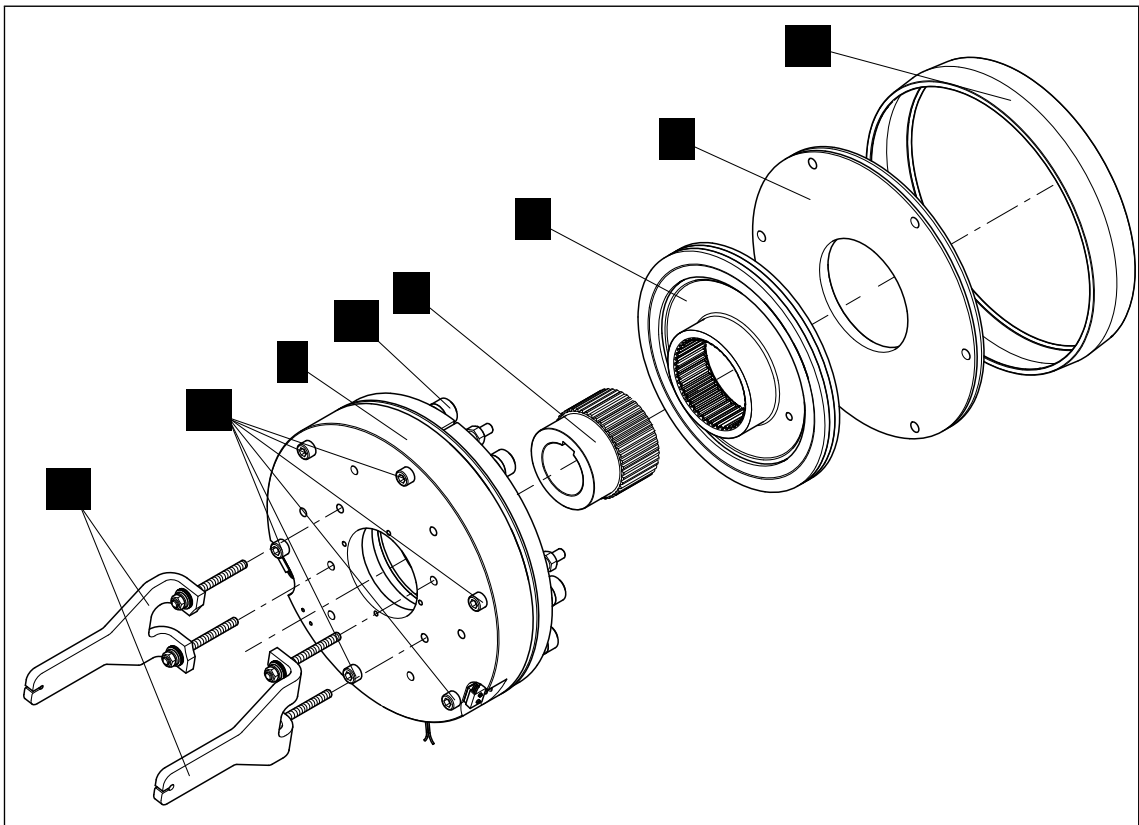


Fig. 17 Spring-applied brake BFK464-□□ S / S.1 / S.2

Item	Designation	Variant
1	Stator, complete	Voltage
3	Complete rotor Rotor, complete noise-reduced	
4	Hub	Bore diameter
6	Flange	
10	Set of fastening screws Cylinder head screw DIN912	for mounting to the motor for flange with through hole
12	Complete manual release	
13	Cover ring	
18	Noise reducer	

7.5 Ordering spare parts

INTORQ BFK464-□□S / S.1 / S.2, stator, complete

- Size** 17 18 19 20 25 28
Design S S.1 S.2
Voltage 103 V / 51.5 V
 103 V / 72 V
 205 V / 103 V
 360 V / 180 V
Braking torque _____ Nm
 Standard (600 mm)
Cable length _____ mm (from 100-1000 mm in 100 mm steps, from 1000-2500 mm in 250 mm steps)
Manual release mounted
Armature plate Standard
Microswitch Monitoring the switching function
Switching noises Damped

Accessories

- Rotor** Aluminium
 Noise-reduced (rotor with sleeve)
Hub _____ mm (for hole diameter, see dimensions)
Flange
Fixing screw set for mounting to the motor
 for mounting to the flange with pass-through holes
Sealing Cover ring
 Shaft seal ring (shaft diameter on request)
 Cap
Noise reduction Noise reducer set

Electrical accessories


Rectifier type: Selection see chapter 5.2.1

- Rectifier** BEG-561-255-030
 BEG-561-255-130
 BEG-561-440-030-1
 BEG-561-440-130

8 Troubleshooting and fault elimination

If any malfunctions should occur when operating the braking system, please check for possible causes based on the following table. If the fault cannot be fixed or eliminated by one of the listed measures, please contact the customer service.

Maloperation of the brake

Fault	Cause	Remedy
Brake does not release	Coil interruption	<ul style="list-style-type: none"> ■ Measure coil resistance using a multimeter: <ul style="list-style-type: none"> - If resistance is too high, replace the complete stator.
	Coil has contact to earth or between windings	<ul style="list-style-type: none"> ■ Measure the coil resistance using a multimeter: <ul style="list-style-type: none"> - Compare the measured resistance with the nominal resistance. Values, see  15. If resistance is too low, replace the complete stator. ■ Check the coil for short to ground using a multimeter: <ul style="list-style-type: none"> - If there is a short to ground, replace the complete stator. ■ Check the brake voltage (see Defective rectifier, voltage too low).
	Wiring defective or wrong	<ul style="list-style-type: none"> ■ Check and correct ■ cable for continuity using a multimeter <ul style="list-style-type: none"> - Replace defective cable.
	Rectifier defective or incorrect	<ul style="list-style-type: none"> ■ Measure rectifier DC voltage using a multimeter. If DC voltage is zero: <ul style="list-style-type: none"> ■ Check AC rectifier voltage. If AC voltage is zero: <ul style="list-style-type: none"> - Switch on power supply - Check fuse - Check wiring. If AC voltage is ok: <ul style="list-style-type: none"> - Check rectifier, - Replace defective rectifier - Diode defective, use suitable new rectifier ■ Check the coil for winding short or ground short. ■ If the rectifier defect occurs again, replace the entire stator, even if you cannot find any fault between turns or short circuit to ground. The error may only occur on warming up.

Fault	Cause	Remedy
Brake does not release	Microswitch incorrectly wired	Check the wiring of the microswitch and correct it.
	Microswitch incorrectly set	Replace the complete stator and complain about the setting of the microswitch to the manufacturer.
	Air gap too big	Adjust the air gap (📖 26) Measure the rotor thickness and compare against the minimum rotor thickness (📖 15). If required, replace the rotor.
Rotor cannot rotate freely	Wrong setting of manual release	Check the dimension "s+s _L " with the brake energised. The dimension must be the same on both sides. Correct if required.
	Air gap "s _L " too small	Check air gap "s _L " and adjust it if necessary (📖 26).
Rotor thickness too small	Rotor has not been replaced in time	Replace the rotor (📖 42).
Voltage is not zero during the functional test (chap. 6.2)	Microswitch incorrectly wired	Check and correct the wiring of the microswitch.
	Microswitch defective or incorrectly set	Replace the complete stator and send the complete stator to the manufacturer.
Voltage too high	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
Voltage too low	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
AC voltage is not mains voltage	Fuse is missing or defective	Select a connection with proper fusing.
	Microswitch incorrectly wired	Check and correct the wiring of the microswitch.
	Microswitch defective or incorrectly set	Replace the complete stator and return the defective complete stator to the manufacturer.

Please read these Operational Instructions carefully and follow them accordingly!
Ignoring these Instructions can lead to lethal accidents, malfunctions, brake failure and damage to other parts.

Contents:

Page 1: - Contents - Declaration of Conformity - Safety and Guideline Signs - TÜV (German Technical Inspectorate) Certification	Page 9: - Installation of Type 8012_0__3 - Installation of Type 8012_1__3
Page 2: - Safety Regulations	Page 10: - Hand Release - Braking Torque Adjustment - Noise Damping
Page 3: - Safety Regulations	Page 11: - Release Monitoring
Page 4: - Brake Illustrations	Page 12: - Wear Monitoring
Page 5: - Parts List	Page 13: - Electrical Connection (Operation with Nominal Voltage)
Page 6: - Table 1: Technical Data - Table 2: Technical Data	Page 14: - Electrical Connection (Operation with Overexcitation)
Page 7: - Table 3: Technical Data - Table 4: Switching Times - Torque-Time Diagram	Page 15: - Brake Inspection (Customer-side after Installation) - Dual Circuit Brake Functional Inspection - Maintenance - Disposal - Malfunctions / Breakdowns
Page 8: - Design - Function - State of Delivery - Application - Installation Conditions	

Declaration of Conformity

A conformity evaluation for the applicable EU directives has been carried out for this product. The conformity evaluation is set out in writing in a separate document and can be requested if required. It is forbidden to start use of the product until you have ensured that all applicable EU directives and directives for the machine or system into which the product has been installed have been fulfilled. Without a conformity evaluation, this product is not suitable for use in areas where there is a high danger of explosion. This statement is based on the ATEX directive.

Safety and Guideline Signs



Danger!
Danger of injury to personnel and damage to machines.



Please Observe!
Guidelines on important points.



Please Observe!
According to German notation, decimal points in this document are represented with a comma (e.g. 0,5 instead of 0.5).

TÜV (German Technical Inspectorate) Certification

License number: **ABV 845**

Safety Regulations

These Safety Regulations are user hints only and may not be complete!



Danger!

Danger of death! Do not touch voltage-carrying cables and components.

To prevent injury or damage, only professionals and specialists should work on the devices.

Danger!

This warning applies if:

- the electromagnetic brake is used incorrectly.
- the electromagnetic brake is modified.
- the relevant standards for safety and / or installation conditions are ignored.



Please Observe!

Before product installation and initial operation, please read the Installation and Operational Instructions carefully and observe the Safety Regulations. Incorrect operation can cause injury or damage. The electromagnetic brakes have been developed in accordance with the latest technology regulations and are, at the point of delivery, operationally safe.

Please Observe!

- Only specialists who are trained in the transport, installation, operation, maintenance and general operation of these devices and who are aware of the relevant standards should be allowed to carry out this work.
- Technical data and specifications (Type tags and documentation) must be followed.
- The correct connection voltage must be connected according to the Type tag.
- Never loosen electrical connections or carry out installations, maintenance or repairs while the voltage connection is energised!
- Cable connections must not be placed under mechanical strain.
- Check electrical components for signs of damage before putting them into operation. Never bring them into contact with water or other fluids.
- The braking torque is lost if the friction lining and / or the friction surface come into contact with oil or grease.



Please Observe!

Please ensure that the brake is clean and oil-free, as both brake circuits have an effect on the same linings. Special sealing measures, among other precautions, may be necessary - in particular in gear applications!

Appointed Use

This safety brake is intended for use in electrically operated elevators and goods elevators according to EC 81-1/1998. The safety brake corresponds to DIN EN 81, Part 1 [Sections 12.4.2.1 (2nd Paragraph), 12.4.2.2, and 12.4.2.5] in its general design and its mode of operation. The effectiveness of the mechanical dual circuit system can be tested at the place of operation (requirement acc. TRA 102).

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directives 2004/108/EC, the individual components produce no emissions. However, functional components e.g. mains-side energisation of the brakes with rectifiers, phase demodulators, ROBA[®]-switch devices or similar controls can produce disturbance which lies above the allowed limit values.

For this reason it is important to read the Installation and Operational Instructions very carefully and to keep to the EMC directives.

Device Conditions



Please Observe!

When dimensioning the brakes, please remember that installation situations, braking torque fluctuations, permitted friction work, run-in behaviour and wear as well as general ambient conditions can all affect the given values. These factors should therefore be carefully assessed, and alignments made accordingly.

Please Observe!

- Mounting dimensions and connecting dimensions must be adjusted according to the size of the brake at the place of installation.
- Use of the brake in extreme environmental conditions or outdoors, directly exposed to the weather, is not permitted.
- The magnetic coils are designed for 100 % duty cycle. However, a switch-on duration of > 60 % duty cycle results in increased temperatures, which cause premature aging on the noise damping system, and therefore to an increase in switching noises. The max. permitted switching frequency is 240 1/h. If the brakes are overexcited, a switching frequency of 180 1/h must not be exceeded. These values apply for intermittent duty S3 60%. The permitted surface temperature on the brake flange must not exceed 80 °C and a max. ambient temperature of 45 °C. The duration of overexcitation should be approx. 1 second.
- The brakes are only designed for dry running. The torque is lost if the friction surfaces come into contact with oil, grease, water or similar substances.
- The braking torque is dependent on the present run-in condition of the brakes.
- Manufacturer-side corrosion protection of the metal surface is provided. The surface is rough sawn and not machined (milled material).

Protection Class I

This protection can only be guaranteed if the basic insulation is intact and if all conductive parts are connected to the PE conductor of the permanent installation. Should the basic insulation fail, the contact voltage cannot remain (VDE 0580).

Ambient Temperature 0 °C up to +45 °C

Danger!

At temperatures of around or under freezing point, condensation can strongly reduce the torque, or the rotors can freeze up. The user is responsible for taking appropriate counter measures.

Safety Regulations

These Safety Regulations are user hints only and may not be complete!

Insulation Material Class F (+155 °C)

The magnetic coil and the casting compound are suitable for use up to a maximum operating temperature of +155 °C.

Brake Storage

- Store the brakes in a horizontal position, in dry rooms and dust and vibration-free.
- Relative air humidity < 60 %.
- Temperature without major fluctuations within a range from - 20 ° up to +60 °C.
- Do not store in direct sunlight or UV light.
- Do not store aggressive, corrosive substances (solvents / acids / lyes / salts etc.) near to the brakes.

For longer storage of more than 2 years, special measures are required (please contact the manufacturers).

Handling

Before installation, the brake must be inspected and found to be in proper condition. The brake function must be inspected both once installation has taken place as well as after longer system downtimes, in order to prevent the drive starting up against possibly seized linings.

User-implemented Protective Measures:

- Please cover moving parts to protect against injury through seizure.
- Place a cover on the magnetic part to protect against injury through high temperatures.
- Protect against electric shocks by installing a conductive connection between the magnetic component and the PE conductor on the permanent installation (Protection Class I) and by carrying out a standardised inspection of the continuous PE conductor connection to all contactable metal parts.
- Protect against highly inductive switch-off peaks by installing varistors, spark quenching units or similar devices according to VDE 0580/2000-07, Paragraph 4.6, to prevent damage to the coil insulations or switch contact consumption in extreme conditions (this protection is contained in *mayr*[®] rectifiers).
- Take precautions against freeze-up of the friction surfaces in high humidity and at low temperatures.

Regulations, Standards and Directives Used:

DIN VDE 0580	Electromagnetic devices and components, general directives
2006/95/EC	Low voltage directive
2004/108/EC	EMC directive
95/16/EC	Elevator directive
EN 81-1	Safety regulations for construction and installation of elevators and small goods elevators
BGV C1	(previously VGB 70) Safety regulations for theatre stage technical systems

Please Observe the Following Standards:

DIN EN ISO 12100-1 and 2	Machine Safety
DIN EN 61000-6-4	Noise emission
EN12016	Interference resistance (for elevators, escalators and moving walkways)
EN 60204	Electrical machine equipment

Liability

- The information, guidelines and technical data in these documents were up to date at the time of printing. Demands on previously delivered brakes are not valid.
- Liability for damage and operational malfunctions will not be taken if
 - the Installation and Operational Instructions are ignored or neglected.
 - the brakes are used inappropriately.
 - the brakes are modified.
 - the brakes are worked on unprofessionally.
 - the brakes are handled or operated incorrectly.

Guarantee

- The guarantee conditions correspond with the Chr. Mayr GmbH + Co. KG delivery conditions.
- Mistakes or deficiencies are to be reported to *mayr*[®] at once!

Conformity Markings

The product conforms to the CE according to the low voltage directive 2006/95/EC.

Identification

mayr[®] components are clearly marked and described on the Type tag:

Manufacturer
<i>mayr</i>[®]
Name/Type
Article number
Serial number

Installation and Operational Instructions for ROBA®-twinstop® Type 8012. _____ Sizes 150 to 350

(B.8012.GB)

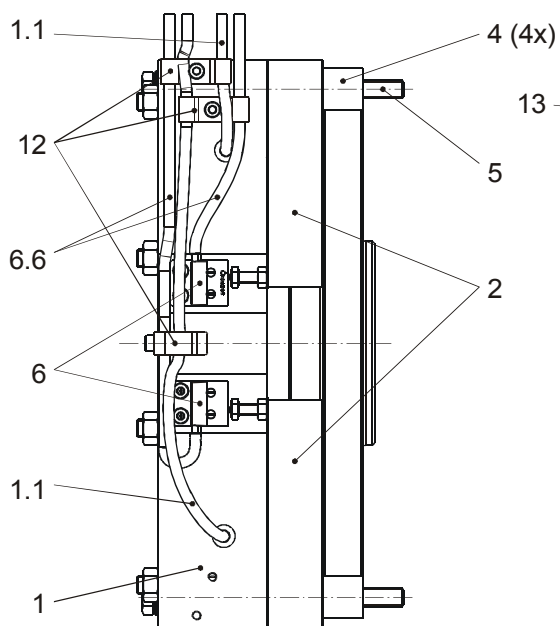


Fig. 1

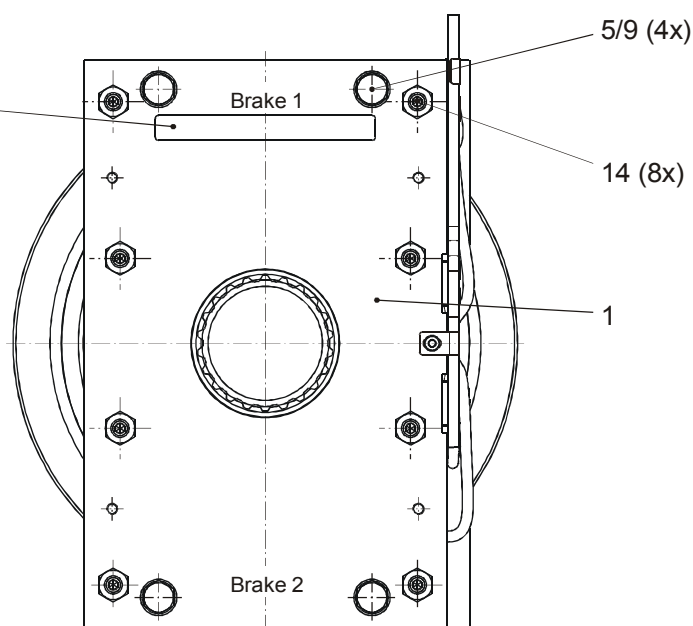


Fig. 2

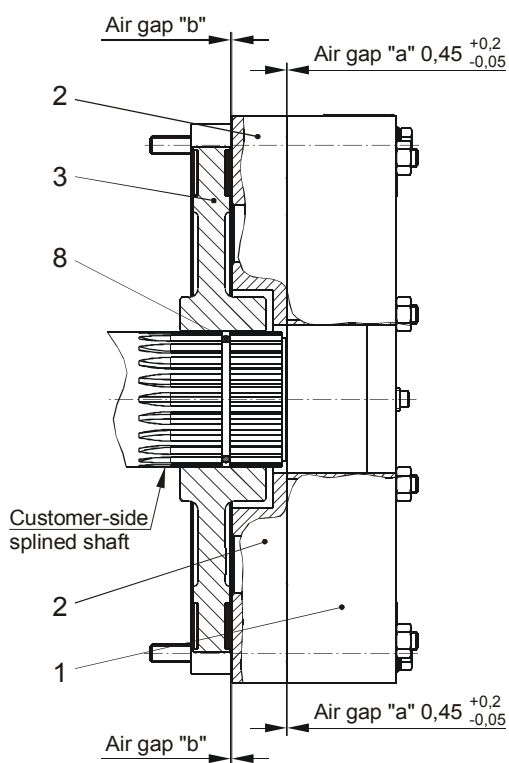


Fig. 3

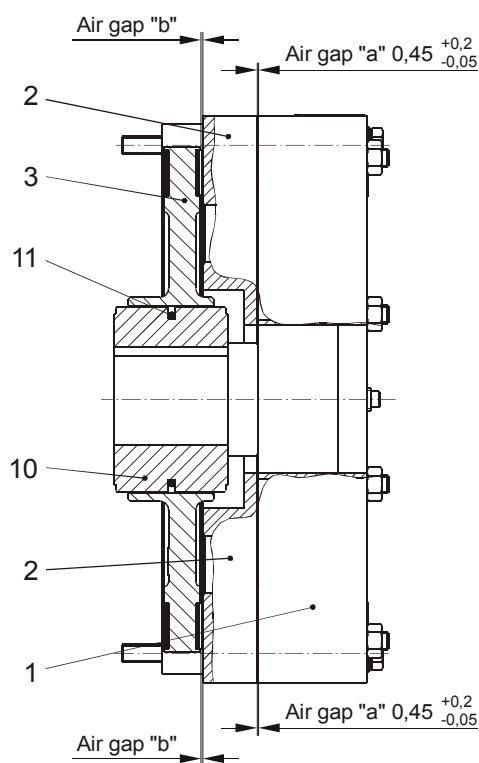


Fig. 4

Installation and Operational Instructions for ROBA®-twinstop® Type 8012.____ Sizes 150 to 350

(B.8012.GB)

Parts List

(Only use mayr® original parts)

Item	Name
1	Coil carrier assembly (incl. magnetic coils)
1.1	Coil cable 2 x AWG18 blue / brown
2	Armature disk
3	Rotor
4	Distance bolts
5	Hexagon head screw acc. DIN EN ISO 4014: For Sizes 150 and 200: M8 x 110 / 8.8 For Size 250: M8 x 120 / 10.9 For Size 350: M10 x 120 / 8.8
6	Release monitoring assembly
6.1	Microswitch incl. adapter plate (Fig. 9; page 11)
6.2	Cap screw (Fig. 9; page 11)
6.3	Hexagon nut (Fig. 9; page 11)
6.4	Hexagon head screw (Fig. 9; page 11)
6.5	Spring washer (Fig. 9; page 11)
6.6	Microswitch cable 3 x AWG20 black / blue / brown
7	Hand release assembly (page 10)
7.1	Hand release lever (page 10)
7.2	Steel ball (page 10)
7.3	Thrust spring (page 10)
7.4	Cap screw (page 10)
7.5	Hexagon nut (page 10)
7.6	Washer (page 10)
8	O-ring NBR 70 (not included in delivery): For Sizes 150 and 200: D48 x 3 For Size 250: D52 x 3 For Size 350 (braking torque up to 410 Nm): D52 x 3 For Size 350 (braking torque > 410 Nm): D60 x 3
9	Washer
10	Hub
11	O-ring
12	Cable clamp
13	Type tag
14	Noise damping
15	Wear monitoring assembly (page 12)
15.1	Microswitch incl. adapter plate (Fig. 10; page 12)
15.2	Cap screw (Fig. 10; page 12)
15.3	Hexagon nut (Fig. 10; page 12)
15.4	Hexagon head screw (Fig. 10; page 12)
15.5	Spring washer (Fig. 10; page 12)

Installation and Operational Instructions for ROBA®-twinstop® Type 8012.____ Sizes 150 to 350

(B.8012.GB)

Table 1: Technical Data (independent of Type and Size)

Nominal air gap ¹⁾ "a" braked (Fig. 3)	0,45 ^{+0,2} / _{-0,05} mm
Limit air gap ²⁾ "a" for rotor replacement	0,9 mm
Inspection air gap "b" on released brake (Fig. 3)	min. 0,25 mm
Protection (coil/casting compound):	IP54
Protection (mechanical):	IP10
Protection (switch):	IP67
Ambient temperature:	0 °C to +45 °C
Duty cycle:	60 %

¹⁾ Measured in the horizontal centre axis area of the respective armature disk (2).



²⁾ **Danger!**

The tension ability of the brake increases, above all when operating with reduced torques and / or in operation with overexcitation.

Due to the brake noise behaviour and for reasons of safety, the rotor (3) must however be replaced at the latest when the air gap reaches 0,9 mm (see section on Maintenance, page 15).

If there is still a risk of the device wearing down to an air gap of 0,9 mm unnoticed, we recommend mounting a wear monitoring device (available on request).

When the air gap reaches "a" > 2,0 mm (design with hand release) or "a" > 2,5 mm (design without hand release), the armature disk (2) will lie against the mechanical contacts, which causes a sudden drop in braking torque to 0 Nm and a risk of load crashes.

Table 2: Technical Data

Size	Nominal torque ³⁾ minimal	Overexcitation voltage 1,5 to 2 x U _{Nom}	Nominal voltage U _{Nom}	Nominal capacity P (20 °C)	Inductivity (207 V – coil)	Rotor thickness in new condition
150	90 Nm	No	24/104/180/207 V DC	2 x 68 W		18 _{-0,05} mm
	120 Nm					
	150 Nm					
	⁴⁾ > 150 Nm					
200	120 Nm	No	24/104/180/207 V DC	2 x 63 W		18 _{-0,05} mm
	160 Nm					
	200 Nm					
	⁴⁾ > 200 Nm					
250	185 Nm	No	24/104/180/207 V DC	2 x 79 W		18 _{-0,05} mm
	230 Nm					
	250 Nm					
	280 Nm					
⁴⁾ > 280 Nm	Yes	24/104/180/207 V DC		18 _{-0,05} mm		
350	250 Nm	No	24/104/180/207 V DC	2 x 82 W		18 _{-0,05} mm
	300 Nm					
	350 Nm					
	410 Nm					
⁴⁾ > 410 Nm	Yes	24/104/180/207 V DC		18 _{-0,05} mm		

³⁾ The braking torque (nominal torque) is the torque effective in the shaft train on slipping brakes, with a sliding speed of 1 m/s referring to the medium friction radius.

⁴⁾ Larger braking torques available on request

Installation and Operational Instructions for ROBA[®]-twinstop[®] Type 8012.____ Sizes 150 to 350

(B.8012.GB)

Table 3: Technical Data

Size	Max. permitted friction work per single circuit ⁵⁾	Inspected max. speed in the elevator area as prototype-inspected brake	Tightening torque on fixing screw Item 5	Weight
150	17500 J	1000 rpm	24 Nm	19,6 kg
200	16500 J	1000 rpm	24 Nm	23,7 kg
250	25500 J	1000 rpm	36 Nm	27,0 kg
350	23500 J	1000 rpm	48 Nm	34,9 kg

⁵⁾ Values apply for a speed of 400 rpm and nominal torque. The value can be doubled for both brake circuits. The value increases at lower speeds and decreases at higher speeds (please contact *mayr*[®]).

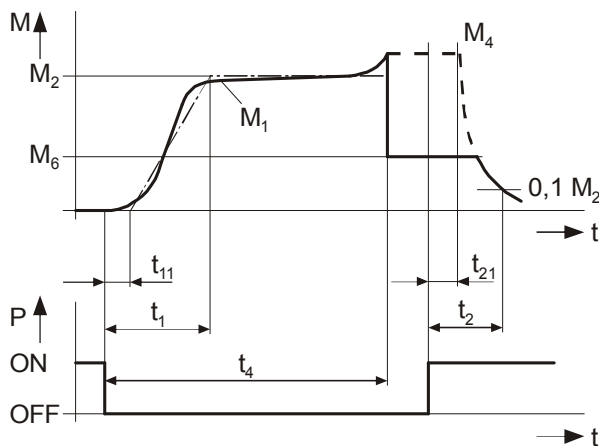
Table 4: Switching Times

Size	Nominal torque minimal	Tightening t_2	Tightening t_2 on overexcitation	Drop-out t_{11} AC	Drop-out t_1 AC	Drop-out t_{11} DC	Drop-out t_1 DC
150	90 Nm	145		250	570	35	140
	120 Nm	170		200	510	27	125
	150 Nm	200		150	450	20	110
	> 150 Nm		Approx. 120				
200	120 Nm	170		420	980	75	230
	160 Nm	225		310	790	53	195
	200 Nm	280		190	620	30	160
	> 200 Nm		Approx. 170				
250	185 Nm	210		300	720	50	180
	230 Nm	260		240	640	40	165
	250 Nm	285		215	590	37	155
	280 Nm	310		180	540	25	140
	> 280 Nm		Approx. 190				
350	250 Nm	290		370	700	45	150
	300 Nm	330		320	640	40	140
	350 Nm	370		270	580	37	130
	410 Nm	400		200	510	30	110
	> 410 Nm		Approx. 240				

Please Observe:

- The use of varistors for spark quenching increases the DC-side switching times.
- At temperatures of around or under freezing point, condensation can strongly reduce the braking torque. The user is responsible for taking appropriate counter measures. The customer is responsible for providing a protective cover against contamination caused by construction sites.

Torque-Time Diagram



Key:

- M_1 = Switching torque
- M_2 = Nominal torque (characteristic torque)
- M_4 = Transmittable torque
- M_6 = Load torque
- t_1 = Connection time
- t_{11} = Response delay on connection
- t_2 = Separation time
- t_{21} = Response delay on separation
- t_4 = Slipping time + t_{11}

Design

The ROBA®-twinstop® is a spring applied, electromagnetically releasing dual circuit brake. It is used for installation in a gearless elevator and serves as a brake assembly on the drive sheave shaft and as part of the protective assembly against excessive upward-moving cage speeds.

Function

ROBA®-twinstop® brakes are spring applied, electromagnetic safety brakes.

Spring applied function:

In de-energised condition, thrust springs press against the armature disks (2). The rotor (3) with the friction linings is therefore held between the armature disks (2) and the machine screw-on surface.

The motor shaft is braked by the rotor (3).

Electromagnetic:

Due to the magnetic force of the coils in the coil carriers (1), the armature disk (2) is attracted against the spring force to the coil carrier (1).

The brake is released and the shaft can rotate freely.

Safety brake function:

The ROBA®-twinstop® brakes reliably and safely in the event of a power switch-off, a power failure or an emergency STOP.

State of Delivery

The brake body is partly assembled with armature disks (2), distance bolts (4), adjusted microswitches (option, dependent on Type) and hand release (Item 7 / option, dependent on Type). The rotor (3), hexagon head screws (5), washers (9) and the hub (10) with O-ring (11) are included loose in delivery.

Please check state of delivery!

Application

- ROBA®-twinstop® for use as holding brakes with occasional emergency STOP braking actions.
- The max. permitted speeds and friction work, see Table 3, must be observed.

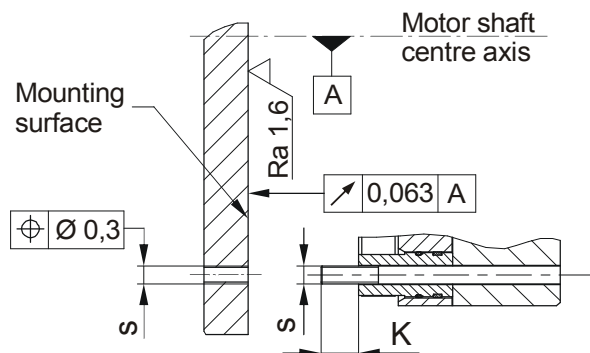


Fig. 5

Installation Conditions

- The eccentricity of the shaft end in relation to the fixing holes must not exceed 0,3 mm.
- The position tolerance of the threaded holes for the hexagon head screws (5) must not exceed 0,3 mm.
- The axial run out deviation of the screw-on surface to the shaft must not exceed the permitted axial run out tolerance of **0,063 mm** in the area of the friction surface. Measuring procedure acc. DIN 42955. Larger deviations can lead to a drop in torque, to continuous slipping on the rotor (3) and to overheating.
- The toothed motor shaft (Type 8012._0_3) should be designed according to the information given in the applicable assembly drawing. The O-ring groove must be inserted before the shaft is splined. The O-ring groove must be free of burrs.



Please Observe!

The dimensions on the assembly drawings are manufacturer-side recommendations.

- On hub designs (Type 8012._1_3), the hub bore (10) tolerances and the shaft must be selected so that the hub toothing (10) is not widened. Widening of the toothing leads to the rotor (3) jamming on the hub (10) and therefore to brake malfunctions. Recommended hub - shaft tolerance H7/k6. If the hub (10) is heated for better joining, the O-ring (11) must be removed beforehand and re-mounted after hub installation. The max. permitted joining temperature of 200 °C must not be exceeded.
- Dimensioning of the key connection according to the requirements shaft diameter, transmittable torque and operating conditions must be carried out. For this, the corresponding user data must be known or the customer must carry out the dimensioning according to the valid calculation basis DIN 6892. For the calculation, a hub quality of $Re = 300 \text{ N/mm}^2$ should be used. The length of the key should lie over the entire hub (10).
- For the dimensioning of the key connections, the permitted tensions common in machine construction must be considered.
- The mounting dimensions and the screw-on surface s with depth $K + 2 \text{ mm}$ ($K = \text{screw projection}$) acc. Catalogue or applicable assembly drawing must be given (Fig. 5).
- The rotor and brake surfaces must be oil and grease-free. A suitable counter friction surface (steel or cast iron) must be used. Sharp-edged interruptions on the friction surfaces must be avoided. Recommended surface quality in the area of the friction surface $Ra = 1,6 \mu\text{m}$. **In particular customer-side mounting surfaces made of grey cast iron are to be rubbed down additionally with fine sandpaper (grain $\approx 200 - 400$), or ideally with a sander.**
- Please abstain from using cleaning agents containing solvents, as they could affect the friction material.
- During longer downtimes, we recommend the use of suitable corrosion protection measures for the mounting surface (e.g. zinc-phosphate coating) until initial operation.

Installation of Type 8012._0_3 (Figs. 1 - 3) (Design with toothed motor shaft)

1. Insert the O-ring (8), slightly greased, acc. Parts List with NBR 70 material (provided by customer) into the motor shaft groove. Please use NLGI Class 2 grease with a basic oil viscosity of 220 mm²/s at 40 °C, e.g. Mobilgrease HP222.
2. Push the rotor (3) onto the motor shaft by hand using light pressure.
Please observe that the longer rotor collar faces away from the machine wall on Sizes 150 und 200, the installation direction is unimportant on Size 250, because the rotor (3) is symmetrical, the graduated rotor collar faces away from the machine wall on Size 350.
Check that the toothing moves easily.
Do not damage the O-ring.
3. Secure the brake bodies using 4 hexagon head screws (5) and washers (9) all-round step-wise evenly (we recommend that you secure the screws using Loctite 243).
Tighten the hexagon head screws using a torque wrench and observe the tightening torque acc. Table 3.
4. **Check air gap "a" = 0,45 $\begin{smallmatrix} +0,2 \\ -0,05 \end{smallmatrix}$ mm** (Fig. 3).
The nominal air gap must be in the horizontal centre axis area on both armature disks (2) (Fig. 1).
5. **Check air gap "b" > 0,25 mm in energised state on the rotor (3)** (Fig. 3).
The inspection air gap must be given.

Installation of Type 8012._1_3 (Figs. 1, 2 and 4) (Hub Design)

1. Mount the hub (10) with the O-ring inserted (Item 11 / **O-ring must be lightly greased**) onto the shaft and bring it into the correct position (the length of the key should cover the entire hub) and secure it axially e.g. using a locking ring).
2. Push the rotor (3) over the O-ring (11) onto the hub (10) by hand using light pressure.
Please observe the the rotor collar (on Size 150, the longer rotor collar) is facing the machine wall.
Ensure that the toothing moves easily.
Do not damage the O-ring.
3. Secure the brake bodies using 4 hexagon head screws (5) and washers (9) all round step-wise evenly (we recommend that you secure the screws using Loctite 243).
Tighten the hexagon head screws using a torque wrench and observe the tightening torque acc. Table 3.
4. **Check air gap "a" = 0,45 $\begin{smallmatrix} +0,2 \\ -0,05 \end{smallmatrix}$ mm** (Fig. 4).
The nominal air gap must be given in the horizontal centre axis area on both armature disks (2) (Fig. 1).
5. **Check air gap "b" > 0,25 mm in energised state on the rotor (3)** (Fig. 4).
The inspection air gap must be given.

Hand Release (7)

(Option dependent on Type for mechanical release of both brake circuits individually using a Bowden cable or by hand)



Danger!

Operate the hand release carefully. Existing loads are put into motion when the hand release is activated.

The hand release is completely assembled manufacturer-side.

The brake is released when both hand release levers (7.1), see Figs. 7 and 8.

By lifting the hand release levers (7.1) up from the steel balls (7.2), both cap screws (7.4) incl. washers (7.6) together with the armature disk (2) are pulled against the coil carrier (1) (Fig. 6). The rotor (3) is then free, thus releasing the brake.

Table 5: Technical Data

Size	Braking torque	Release force per braking circuit with	
		Bowden cable	Hand release lever
150	150 Nm	Approx. 160 N	Approx. 95 N
200	200 Nm	Approx. 200 N	Approx. 120 N
250	280 Nm	Approx. 280 N	Approx. 165 N
350	410 Nm	Approx. 370 N	Approx. 215 N

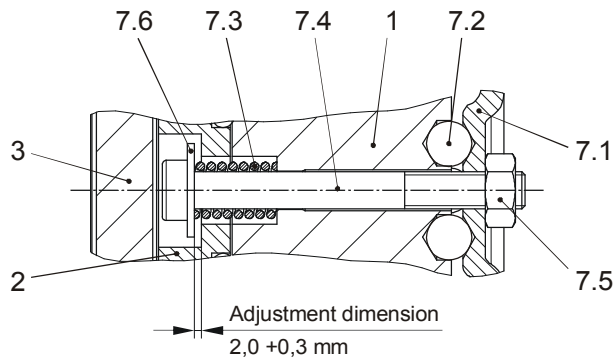


Fig. 6

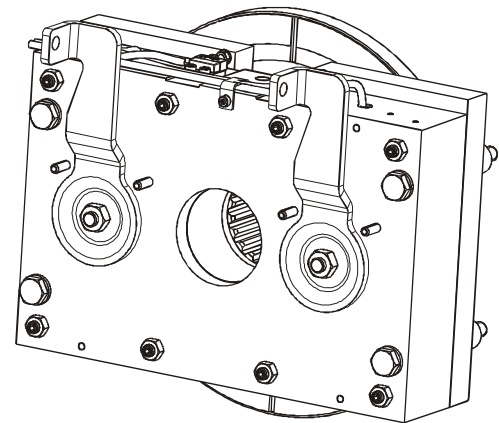


Fig. 7 (Hand release for Bowden cable)

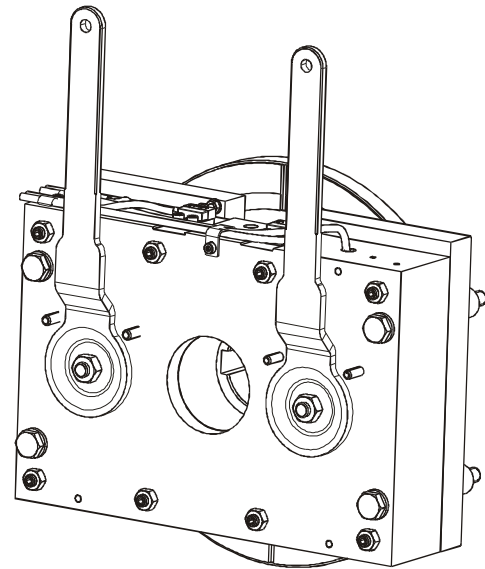


Fig. 8 (Hand release with hand release lever)

Braking Torque Adjustment

ROBA®-twinstop® brakes are delivered adjusted to the braking torque required on order.

Noise Damping (Item 14 / Fig. 2)

The noise damping used here was set and adjusted manufacturer-side. However, this component is subject to aging dependent on the application or operational conditions (torque adjustment, switching frequency, ambient conditions, system vibrations etc.)



Please Observe!

Replacing the damping element is only permitted at the *mayr*® site of manufacture.

Release Monitoring (6) Fig. 9 (Option, dependent on Type)

ROBA®-twinstop® brakes are delivered with one release monitoring (6) per brake circuit.
The microswitches (6.1) emit a signal for every brake condition change "signal brake opened or brake closed"

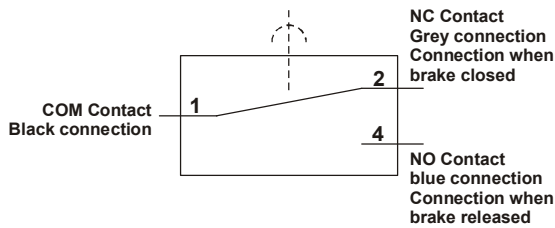
On initial operation:

Connection as NO contact (black and blue strands).

The customer is responsible for a signal evaluation of both conditions.

From the point at which the brake is energised, a time span of three times the separation time must pass before the microswitch signal on the release monitoring is evaluated.

Wiring Diagram:



Re-adjustment is possible via the hexagon head screws (6.4) and the hexagon nuts (6.3).
If this proves necessary, please contact the manufacturers.

Function

When the magnetic coils are energised in the coil carriers (1), the armature disks (2) are attracted to the coil carrier (1), the microswitches (6.1) emit a signal and the brake is released.

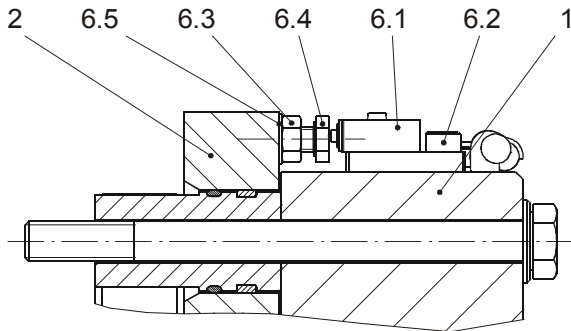


Fig. 9

Manufacturer-side Adjustment and Functional Inspection of the Microswitch (6.1), see Fig. 9



Danger!

The brake is mounted, secured to the tightening torque (see Table 3) and the coil is de-energised.

- Turn the hexagon head screw (6.4) in the direction of the microswitch (6.1) up to the microswitch tappet.
- Tighten the hexagon nut (6.3), so that the hexagon head screw (6.4) is placed under pre-tension by the spring washer (6.5).
- Put a feeler gauge 0,12 mm (loose sensor plate) between the switch tappet and the hexagon head screw (6.4).
- Connect the inspection or measurement device (diode inspection) to the NO contact black/blue.
- Turn the hexagon head screw (6.4) in the direction of the switch (6.1) up to **signal "ON"**, turn it back to the **signal "OFF"** and counter the hexagon head screw (6.4) with the hexagon nut (6.3).
- Energise brake → **Signal "ON"**,
De-energise brake → **Signal "OFF"**,
Re-adjust if necessary and repeat the inspection.
- Inspection with feeler gauge 0,16 mm
energised → **Signal "ON"**
de-energised → **Signal "ON"**
- Inspection with feeler gauge 0,12 mm
energised → **Signal "ON"**
de-energised → **Signal "OFF"**
- Put the feeler gauge 0,20 mm between the armature disk (2) and the coil carrier (1) in the microswitch (6.1) area and then energise the brake. **The signal must be "ON"**.
- Paint items 6.2, 6.3 and 6.4 with sealing lacquer.

Customer-side Inspection after Mounting onto the Elevator Machine

The customer-side contact is an NO contact.
Please inspect the release monitoring of both circuits:
Brake de-energised → **Signal "OFF"**,
Brake energised → **Signal "ON"**

**Table 6:
Microswitch Specifications (6.1)**

Characteristic values for measurement:	250 V~ / 3 A
Minimum switching capacity:	12 V, 10 mA DC-12
Recommended switching capacity: for maximum lifetime and reliability	24 V, 10...50 mA DC-12 DC-13 with free-wheeling diode!

Usage category acc. IEC 60947-5-1:
DC-12 (resistance load), DC-13 (inductive load)

Installation and Operational Instructions for ROBA®-twinstop® Type 8012.____ Sizes 150 to 350

(B.8012.GB)

Wear Monitoring (15) Fig. 10 (Option, dependent on Type)

Only one microswitch for wear monitoring (15) is required per ROBA®-twinstop®, which is mounted onto the brake as shown in Fig. 10.

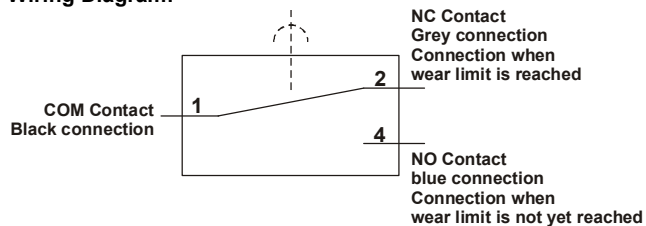
The ROBA®-twinstop® brake is delivered with manufacturer-side adjusted wear monitoring (15).

Function

Due to wear on the rotor, (3) the air gap "a" between the coil carrier (1) and the armature disk increases (2). Once the maximum air gap (limit air gap) of 0,9 mm has been reached (Table 1), the microswitch contact (15.1) switches over and emits a signal. The rotor (3) must be replaced.

The customer is responsible for signal evaluation.

Wiring Diagram:



Before replacing the rotor (3)

- Clean the brake and remove abraded particles using compressed air.
- Do not inhale brake dust.
- Measure the rotor thickness "new" (see Table 2).

Replacing the rotor (3)

Replace the rotor by following the Brake Installation instructions backwards.



Danger!

The drive brake must be load-free on hoist drives. Otherwise there is a danger of load crashes!

Manufacturer-side Adjustment and Functional Inspection of the Microswitch (15.1), see Fig. 10



Danger!

The brake is mounted, secured to the tightening torque (see Table 3) and the coil is de-energised.

1. Connect the inspection or measurement device (diode inspection) to the NC contact black/grey.
2. Turn the hexagon head screw (15.4) in the direction of the microswitch (15.1) until it switches, and apply pre-tension via the spring washer (15.5) using the hexagon nut (15.3).
3. Hold the hexagon nut (15.3) and turn the hexagon head screw (15.4) back until the microswitch contact (15.1) switches over again.
4. Mark the position of the hexagon head screw (15.4) (marker pen).
5. Hold the hexagon head screw (15.3) and turn the hexagon head screw (15.4) approx. 0,6 – 0,7 turns back in the direction of the microswitch (15.1).
6. Counter the hexagon head screw (15.4) with the hexagon nut (15.3) and mark the position using red securing lacquer.
7. Mount the Wear Monitoring guideline sign.

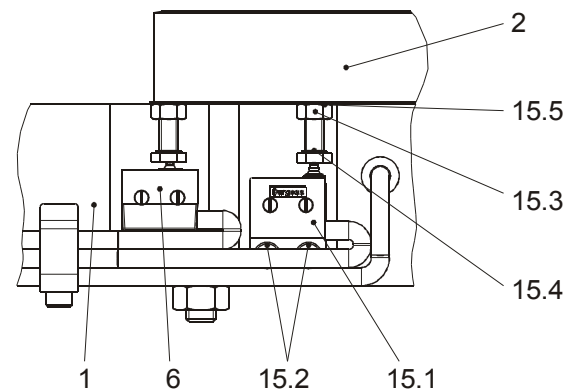


Fig. 10

Table 7: Microswitch Specifications (15.1)

Characteristic values for measurement:	250 V~ / 3 A
Minimum switching capacity:	12 V, 10 mA DC-12
Recommended switching capacity: for maximum lifetime and reliability	24 V, 10...50 mA DC-12 DC-13 with free-wheeling diode!

Usage category acc. IEC 60947-5-1:
DC-12 (resistance load), DC-13 (inductive load)

Electrical Connection for Operation with Nominal Voltage (Without Overexcitation)

DC current is necessary for operation of the brake. The coil voltage is indicated on the Type tag (14) as well as on the brake body and is designed according to the DIN IEC 60038 ($\pm 10\%$ tolerance). Operation must take place via DC voltage with a low ripple content, e.g. via a bridge rectifier or with another suitable DC supply. Dependent on the brake equipment, the connection possibilities can vary. Please follow the exact connections according to the Wiring Diagram. The manufacturer and the user must observe the applicable directives and standards (e.g. DIN EN 60204-1 and DIN VDE 0580). Their observance must be guaranteed and double-checked!

Earthing Connection

The brake is designed for Protection Class I. This protection covers not only the basic insulation, but also the connection of all conductive parts to the PE conductor on the fixed installation. If the basic insulation fails, no contact voltage will remain. Please carry out a standardized inspection of the PE conductor connections to all contactable metal parts!

Supply Voltage Requirements

In order to minimise noise development of the released brake, it must only be operated via DC current with low ripple content. AC current operation can take place using a bridge rectifier or another suitable DC power supply. Supplies whose output voltages have a high ripple content (e.g. a half-wave rectifier, a switch-mode mains adaptor, ...) are not suitable for operation of the brake.

Device Fuses

To protect against damage from short circuits, please add suitable device fuses to the mains cable.

Switching Behaviour

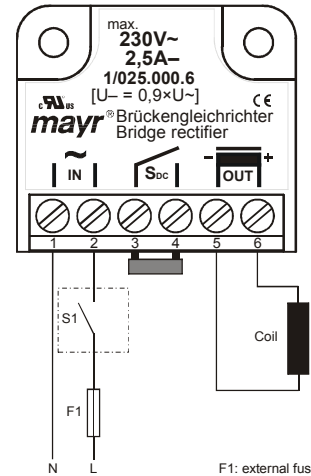
The operational behaviour of a brake is to a large extent dependent on the switching mode used. Furthermore, the switching times are influenced by the temperature and the air gap between the armature disk (2) and the coil carrier (1) (dependent on the wear condition of the linings).

Magnetic Field Build-up

When the voltage is switched on, a magnetic field is built up in the brake coil, which attracts the armature disk (2) to the coil carrier (1) and releases the brake.

Magnetic Field Removal

AC-side Switching

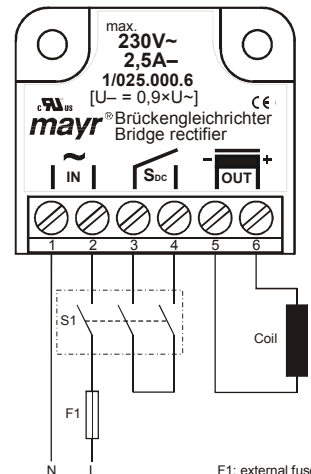


The power circuit is interrupted before the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

When switching times are not important, please switch AC-side, as no protective measures are necessary for coil and switching contacts.

→ **Low-noise switching**; however, the brake engagement time is longer (c. 6-10 times longer than with DC-side switching). Use for non-critical brake times.

DC-side Switching



The power circuit is interrupted between the rectifier and the coil as well as mains-side. The magnetic field reduces extremely quickly. This causes a quick rise in braking torque.

When switching DC-side, high voltage peaks are produced in the coil, which lead to wear on the contacts from sparks and to destruction of the insulation.

→ **Short brake engagement times (e.g. for emergency STOP)**; however, louder switching noises.

Protective Circuit

When using DC-side switching, the coil must be protected by a suitable protective circuit according to VDE 0580, which is integrated in *mayr*[®] rectifiers. To protect the switching contact from consumption when using DC-side switching, additional protective measures are necessary (e.g. series connection of switching contacts). The switching contacts used should have a minimum contact opening of 3 mm and should be suitable for inductive load switching. Please make sure on selection that the rated voltage and the rated operation current are sufficient. Depending on the application, the switching contact can also be protected by other protective circuits (e.g. *mayr*[®]-spark quenching unit), although this may of course then alter the switching time.

Installation and Operational Instructions for ROBA®-twinstop® Type 8012.____ Sizes 150 to 350

(B.8012.GB)

Electrical Connection for Operation with Overexcitation

DC current is necessary for operation of the brake. The coil voltage is indicated on the Type tag (14) as well as on the brake body and is designed according to the DIN IEC 60038 ($\pm 10\%$ tolerance). The brake may only be operated with overexcitation (e.g. with a ROBA®-switch fast acting rectifier or phase demodulator). Dependent on the brake equipment, the connection possibilities can vary. Please follow the exact connections according to the Wiring Diagram. The manufacturer and the user must observe the applicable directives and standards (e.g. DIN EN 60204-1 and DIN VDE 0580). Their observance must be guaranteed and double-checked!

Earthing Connection

The brake is designed for Protection Class I. This protection covers not only the basic insulation, but also the connection of all conductive parts to the PE conductor on the fixed installation. If the basic insulation fails, no contact voltage will remain. Please carry out a standardized inspection of the PE conductor connections to all contactable metal parts!

Device Fuses

To protect against damage from short circuits, please add suitable device fuses to the mains cable.

Switching Behaviour

The operational behaviour of a brake is to a large extent dependent on the switching mode used. Furthermore, the switching times are influenced by the temperature and the air gap between the armature disk (2) and the coil carrier (1) (dependent on the wear condition of the linings).

Magnetic Field Build-up

When the voltage is switched on, a magnetic field is built up in the brake coil, which attracts the armature disk (2) to the coil carrier (1) and releases the brake.

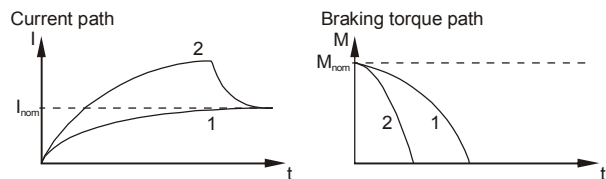
Field Build-up with Normal Excitation

If we energise the magnetic coil with nominal voltage, the coil voltage does not immediately reach its nominal value. The coil inductivity causes the current to increase slowly as an exponential function. Accordingly, the build-up of the magnetic field takes place more slowly and the braking torque drop (curve 1) is also delayed.

Field Build-up with Overexcitation

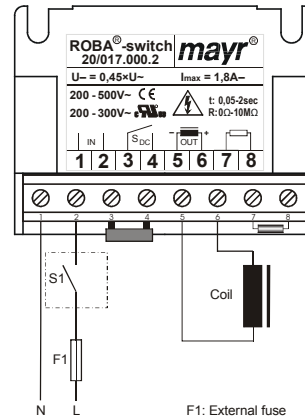
A quicker and safer drop in braking torque is achieved if the coil is temporarily placed under a higher voltage than the nominal voltage, as the current then increases more quickly. Once the brake is released, it is possible to switch over to the nominal voltage (curve 2). The effective capacity may however not be larger than the nominal capacity of the coil.

The ROBA®-switch fast acting rectifier works on this principle, which is obligatory for safe operation of this brake.



Magnetic Field Removal

AC-side Switching

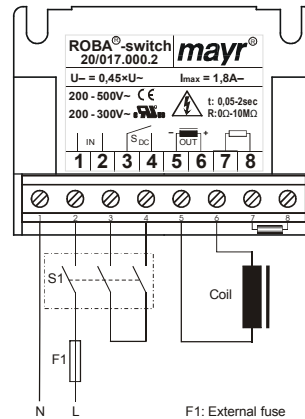


The power circuit is interrupted before the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

When switching times are not important, please switch AC-side, as no protective measures are necessary for coil and switching contacts.

⇒ **Low-noise switching**; however, the brake engagement time is longer (c. 6-10 times longer than with DC-side switching). Use for non-critical brake times.

DC-side Switching



The power circuit is interrupted between the rectifier and the coil as well as mains-side. The magnetic field reduces extremely quickly. This causes a quick rise in braking torque.

When switching DC-side, high voltage peaks are produced in the coil, which lead to wear on the contacts from sparks and to destruction of the insulation.

⇒ **Short brake engagement times (e.g. for emergency STOP)**; however, louder switching noises.

Protective Circuit

When using DC-side switching, the coil must be protected by a suitable protective circuit according to VDE 0580, which is integrated in mayr® rectifiers. To protect the switching contact from consumption when using DC-side switching, additional protective measures are necessary (e.g. series connection of switching contacts). The switching contacts used should have a minimum contact opening of 3 mm and should be suitable for inductive load switching. Please make sure on selection that the rated voltage and the rated operation current are sufficient. Depending on the application, the switching contact can also be protected by other protective circuits (e.g. mayr®-spark quenching unit), although this may of course then alter the switching times.


Customer-side Brake Inspection (after Mounting onto the Elevator Machine)

- Individual air gap inspection**
(Nominal air gap "a" and air gap "b" on both brake circuits acc. Table 1 and Figs. 3 / 4).
- Braking torque inspection:**
Please compare the requested braking torque with the torque stated on the Type Tag.
- Release function inspection**
(Battery operated to guarantee emergency escape for passengers during a power failure).
- Switching function inspection**

Energised brake	Signal "ON" (NO contact)
De-energised brake	Signal "OFF" (NO contact)

Dual Circuit Brake Functional Inspection

The ROBA®-twinstop® brake is equipped with a double safety (redundant) brake system. This means that, should one circuit fail, the braking effect is maintained.



Danger!
Should the elevator begin to move after release of one brake circuit or should it fail to react to the braking procedure, the energised coil must be switched off immediately!
The dual circuit function is not guaranteed.
Shut down the elevator, de-install and inspect the brake.

The individual circuit inspection is carried out by energising the individual circuits with nominal voltage.

Inspection brake circuit 1:

1. Energise brake circuit 2.
2. Trigger an emergency STOP with brake circuit 1 and inspect the stopping distance according to the elevator regulations.
3. De-energise brake circuit 2.

Inspection brake circuit 2:

1. Energise brake circuit 1.
2. Trigger an emergency STOP with the brake circuit 2 and inspect the stopping distance according to the elevator regulations.
3. De-energise brake circuit 1.

Inspection both circuits:

Energise both braking circuits with nominal voltage. Trigger an emergency STOP and inspect the stopping distance according to the elevator regulations. The stopping distance must be much shorter than the stopping distance for an individual circuit.

Malfunctions / Breakdowns:

Malfunctions	Possible Causes	Solutions
Brake does not release	Incorrect voltage on rectifier Rectifier failure Air gap too large (worn rotor) Coil interruption	Apply correct voltage Replace rectifier Replace rotor Replace brake
Release monitoring does not switch	Brake does not release Defective microswitch	Solution as above Replace the microswitch (manufacturer-side)

Maintenance

ROBA®-twinstop® brakes are mainly maintenance-free. The friction linings are robust and wear-resistant. This ensures a particularly long service lifetime. However, the friction linings are subject to functional wear on frequent use of emergency STOP. Therefore, the following inspections are to be carried out at regular inspection intervals:

- Braking torque or retardation inspection (individual brake circuits). (TÜV interval)
- Inspection of air gap braked (both brake circuits) (TÜV interval)
- Inspection of toothing backlash, toothed hub on motor to the rotor (3) or hub (10) to the rotor (3) Max. permitted toothing backlash 0,5°. (TÜV interval)

To inspect the rotor (3) wear condition, please measure the air gap "a" acc. Table 1 and Figs. 3 / 4.

If the brake limit air gap has been reached (0,9 mm), meaning that the friction linings are worn down, the rotor (3) must be replaced.

Please follow the Installation section backwards to dismantle the brake (page 9).

Disposal

Our electromagnetic brake components must be disposed of separately as they consist of different materials. Please observe the relevant authority regulations. Code numbers may vary according to the dismantling process (metal, plastic and cable).

Electronic components

(Rectifier / ROBA®-switch / Microswitch):

Products which have not been dismantled can be disposed of under the Code 160214 (mixed materials) or Components under Code. No. 160216, or can be disposed of by a certified disposal firm.

Brake bodies made of steel pads with coil / cable and all other steel components:

Steel scrap (Code No. 160117)

Aluminium components:

Non-ferrous metals (Code No. 160118)

Brake rotor (steel or aluminium pads with friction linings):

Brake linings (Code No. 160112)

Seals, O-rings, V-seals, elastomers, terminal boxes (PVC):

Plastic (Code No. 160119)

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